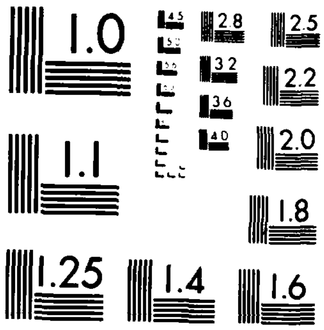
AD-A149 595 REPORT OF THE INTERNATIONAL ICE PATROL SERVICES IN THE NORTH ATLANTIC OCEAN SEASON OF 1982(U) COAST GUARD WASHINGTON DC 28 FEB 84 USCG-BULL-68 1/1

UNCLASSIFIED F/G 8/12 NL

END

FILMED

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A149 595

DTIC FILE COPY

U.S. Department
of Transportation
**United States
Coast Guard**

Report of the International Ice Patrol in the North Atlantic

INTERNATIONAL
ICE PATROL

1982 Season
Bulletin No. 68
CG-188-37

DTIC
ELECTE
JAN 29 1985
D
E

85 01 16 080

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS G-OIO
U.S. COAST GUARD
WASHINGTON, D.C. 20593
(202) 426-1881

FEB 28 1984

Bulletin No. 68

REPORT OF THE INTERNATIONAL ICE PATROL SERVICES IN THE NORTH ATLANTIC OCEAN

Season of 1982

CG-188-37

FOREWORD

Forwarded herewith is Bulletin No. 68 of the International Ice Patrol describing the Patrol's services, ice observations, and conditions during the 1982 season.

DTIC COPY INSPECTED

Accession For
NTIS GRA&I
DTIC TAB
Unannounced
Justification
By
Distribution/
Availability Codes
Dist | Avail and/or Special
A-1

N. C. VENZKE
Chief, Office of Operations

DISTRIBUTION - SDL No. 118

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A	1*	1		1*		1*		1*																		
B		*			10					2				2	5		1									
C	1*																1*									
D																							60		2	2
E																										
F																										
G																										
H																										

NON-STANDARD DISTRIBUTION:

* A:adfh LANTAREA only
* B:b LANTAREA (5); B:b PACAREA (5)
* C: aq LANTAREA only
SML CG-4

Table of Contents

Introduction

This is the 68th in a series of annual reports on the International Ice Patrol Service in the North Atlantic. It contains information on ice conditions and Ice Patrol operations for 1982. The U. S. Coast Guard conducts the International Ice Patrol Service in the North Atlantic Ocean under the provisions of Title 46, U. S. Code, Sections 738, 738a through 738d, and the International Convention for the Safety of Life at Sea (SOLAS), 1960, regulations 5-8. Commander, International Ice Patrol, working under Commander, Coast Guard Atlantic Area, directs the International Ice Patrol from offices located at Governors Island, New York. The office analyzes ice and environmental data and prepares the daily ice bulletins and facsimile charts, and replies to any requests for special ice information. It also controls the aerial Ice Reconnaissance Detachment and any surface patrol cutters when assigned, both of which patrol the southeastern, southern, and southwestern limits of icebergs.

Vice Admiral James S. Gracey, U. S. Coast Guard, was Commander, Atlantic Area until May 24, 1982, at which time he was relieved by Vice Admiral Wayne E. Caldwell, U. S. Coast Guard. Commander J. J. McClelland, Jr., U. S. Coast Guard, was Commander, International Ice Patrol, and was directly responsible for the management of the Patrol during the entire season.

A pre-season deployment was made from 1-3 March 1982 to determine the early season iceberg distribution. Based on this trip, the regular deployments began on 10 March with the 1982 season officially opening on 13 March.

From that date until 27 August 1982, an aerial Ice Reconnaisance Detachment (ICERECDET) operated from Gander, Newfoundland, averaging one patrol every two days over the Grand Banks. The season officially closed on 1 September 1982.

No U. S. Coast Guard cutters were deployed to provide Ice Patrol oceanographic support or to act as surface patrol vessels this year.

During the 1982 season, an estimated 188 icebergs drifted south of 48 degrees North. Table 1 shows monthly estimates of icebergs that crossed 48 degrees North.

Table 1
Estimated Number of Icebergs South of Latitude 48 Degrees North, 1982 Season

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1982	0	0	0	0	0	0	17	61	13	94	3	0
Total 1946-1982	10	2	4	11	65	272	1172	3131	2993	1865	489	100
Average 1946-1982	0	0	0	0	2	7	32	85	81	50	13	3
Total 1900-1982	256	109	110	91	185	724	3274	7976	10076	5383	1685	489
Average 1900-1982	3	1	1	1	2	9	39	96	121	65	20	6

Data Collection and Dissemination

During the 1982 Ice Patrol Fiscal year (considered from 1 September 1981 through 30 September 1982), 118 aircraft sorties were flown in support of the International Ice Patrol. These included pre-season flights, ice observation and logistics flights during the season, and post-season flights. Pre-season flights determined iceberg concentrations north of 48°N which were necessary to estimate the time when icebergs would threaten the North Atlantic shipping lanes in the vicinity of the Grand Banks of Newfoundland. During the active season, ice observation flights located the southwestern, southern, and southeastern limits of icebergs. Logistics flights were necessary to rotate ice reconnaissance detachment personnel and for unusual aircraft maintenance. Post-season flights were made to retrieve parts and equipment from Gander and to close out all business transactions from the season. Table 2 shows aircraft utilization during the 1982 season.

U. S. Coast Guard C-130 Aircraft, deployed ırom Coast Guard Air Station Elizabeth City, North Carolina, conducted the aerial ice reconnaissance. These aircraft operated from Gander, Newfoundland, for the first time. This proved to be operationally and financially superior to operating out of St. John's as in previous years. Weather conditions at Gander allowed more consistent flight operations at lower fuel costs.

Table 2
Aerial Ice Reconnaissance From 1 September 1981 to 30 September 1982*

Ice Reconnaissance Flights	Number of Flights	Number of Hours Flown
Pre-season	6	37
In-Season	109	539
Post-season	3	10
Total	118	586

Note: In-season flights include transport of personnel to and from Gander for normal crew rotation. There were 79 dedicated to ice reconnaisance, with a total of 396 flight hours. They are summarized as follows:

Month	Ice Recon Flights
MAR	10
APR	15
MAY	13
JUN	16
JUL	11
AUG	14
Totals	79

*Prior to the 1982 Ice Patrol Season, the Ice Patrol's annual bulletins covered the period from 1 September to 30 August of the following year. This period was extended an additional month in 1982 to reduce the probability of an ice season carrying over into the following year and to correspond with the fiscal year which begins on 1 October.

U. S. Coast Guard Communications Station Boston, Massachusetts, NMF/NIK, was the primary radio station used for the dissemination of the daily ice bulletin and facsimile chart after preparation by the Ice Patrol office in New York. Other transmitting stations included Canadian Coast Guard Radio Station St. John's/VON, Canadian Forces Radio Station Mill Cove/CFH, and U. S. Navy LCMP Broadcast Stations Norfolk/NAM, Thurso, Scotland, and Keflavik, Iceland.

Canadian Forces Station Mill Cove/CFH as well as AM Radio Station Bracknell/GFE, United Kingdom are radio facsimile broadcasting stations which used Ice Patrol limits in their broadcasts. Canadian Coast Guard Radio Station St. John's/VON provided special broadcasts.

The International Ice Patrol requests all ships transiting the area of the Grand Banks to report ice sightings, weather, and sea surface temperatures via U. S. Coast Guard Communications Station Boston, NMF/NIK. Response to this request is shown in Table 3. Appendix A lists all contributors. Commander, International Ice Patrol extends a sincere thank you to all stations and ships which contributed.

Table 3

Number of ships furnishing Sea Surface Temperature (SST) reports	79
Number of SST reports received	434
Number of ships furnishing ice reports	47
Number of ice reports received	92
First Ice Bulletin	130000Z MAR 82
Last Ice Bulletin	020000Z SEP 82
Number of Facsimile Charts transmitted	171

List of Noteworthy Events

NOVEMBER 1981	International Ice Patrol (IIP) personnel visited CANFORSTA Summerside, Prince Edward Island, CN between 2 and 4 November to determine the feasibility of moving the Ice Reconnaissance Detachment (ICERECDET) operations there. On the 18th and 19th of this month, IIP personnel made a trip to Gander, NFLD to evaluate Gander as a base of operations for the ICERECDET.
JANUARY 1982	IIP made no pre-season deployments during the month. IIP closely monitored berg sightings from Ice Central Ottawa. On the 15th of the month, the oil platform OCEAN RANGER capsized during heavy storm conditions while stationed in the IIP operations area.
FEBRUARY 1982	No pre-season deployments were conducted. On February 19th IIP received the first preliminary berg reports from Canadian reconnaisance flights which reported five bergs along the Labrador coast, the southernmost one sighted at 53°50'N 55°35'W.
MARCH 1982	IIP conducted the first pre-season trip to Gander between 1 and 3 March. One reconnaisance flight was flown on this trip and 10 bergs were sighted, all north of 50°50'N. IIP deployed two Tiros Oceanographic Drifters on this flight to gather oceanographic data (see Appendix B, Oceanographic Conditions, for more details). The first regular season deployment departed on the 10th of the month. IIP flew pre-season reconnaisance flights on the 11th and the 12th. The 11 March flight was flown in conjunction with Canadian Atmospheric Environment Service (AES) representatives and was dedicated to the evaluation of the aircraft's Side-Looking Airborne Radar (SLAR) as an effective detector of icebergs and sea ice.
APRIL 1982	IIP deployed the third and fourth Tiros Oceanographic Drifters on 1 April. On 15 April, the annual Titanic Commemorative flight was flown over the position that the ship was reported to have sunk and a commemorative wreath was dropped over the site along with the cremated remains of Mr. Frank Goldsmith, a young survivor of the Titanic cruise who passed away in January 1982.
MAY 1982	This was a normal Ice Patrol month, with 13 reconnaisance flights and 219 new bergs sighted. No unusual events.
JUNE 1982	On 16 June, the M/V Canadian Bulker collided with an iceberg at position 47°29.2'N 49°19.5'W, well within IIP reported ice limits. The vessel continued on to St. John's for repairs.
JULY 1982	As warmer weather moved in over the patrol area, visibility decreased and hampered reconnaissance operations. IIP conducted eleven reconnaissance flights during the month.
AUGUST 1982	This somewhat prolonged Ice Patrol reconnaissance season came to a close this month. The last regular season ICERECDET deployment returned to the U. S. on 27 August.
SEPTEMBER 1982	The season was officially closed at 0200000 GMT September with the transmission of the final IIP message bulletin. One post-season trip was made to Gander from the 13th to the 15th to close out all commercial contracts and retrieve spare parts kept in storage.

Discussion of Environmental Conditions

Environmental factors, including average temperatures and precipitation levels, play an important role in the production and deterioration of icebergs. The weather conditions for the last quarter of 1981 were slightly warmer than normal throughout Newfoundland and Labrador. Rainfall totals were above normal through the end of the year. The arrival of 1982 brought colder weather with below normal temperatures (Table 4) being recorded throughout the province for the first six months of the year. The summer months had scattered weather patterns without any significant temperature or precipitation trends developing. Major environmental conditions for the 1982 International Ice Patrol season, from several stations throughout Newfoundland and Labrador, are listed in Table 4. The four stations are Hopedale, Labrador (55°25'N, 60°10'W); Goose, Labrador (53°25'N, 60°20'W); Gander, Newfoundland (48°55'N, 54°35'W); and St. John's, Newfoundland (47°35'N, 52°40'W).

Table 4
Environmental Conditions for 1982 International Ice Patrol Season

		Temp °C				
	Station	Monthly Mean	Diff. from Mean	Total Precipitation (mm)	% of Normal Precipitation	% of Normal Snowfall
	Hopedale	9.2	1.5	69.6	95	★
SEP 1981	Goose	10.9	1.1	130.5	172	★
	Gander	12.0	.2	122.8	146	★
	St. Johns	11.7	-.2	186.9	167	★
	Hopedale	4.0	1.6	34.0	54	56
OCT	Goose	3.9	.7	104.7	146	78
	Gander	6.9	.6	208.7	219	37
	St. Johns	8.1	1.0	322.2	232	67
	Hopedale	.2	3.4	★★	★★	81
NOV	Goose	-2.3	1.2	75.5	108	158
	Gander	2.1	.2	12.8	121	125
	St. Johns	4.0	.5	192.3	119	12
	Hopedale	-7.2	3.5	63.6	112	92
DEC	Goose	-8.3	3.9	98.5	144	85
	Gander	-1.4	1.9	129.6	132	129
	St. Johns	.4	1.6	112.4	67	45
	Hopedale	-14.4	1.4	91.5	148	166
JAN 1982	Goose	-16.7	-.5	79.4	115	155
	Gander	-6.6	-.6	133.3	142	166
	St. Johns	-4.2	-.5	227.8	157	184
	Hopedale	-20.2	-5.0	45.2	90	★★
FEB	Goose	-20.2	-5.8	65.6	109	★★
	Gander	-10.3	-4.0	153.1	152	★★
	St. Johns	-7.0	-2.8	159.0	102	★★
	Hopedale	★★	★★	66.2	119	130
MAR	Goose	-12.3	-4.0	89.0	128	132
	Gander	-5.3	-1.8	56.9	59	70
	St. Johns	-4.0	-1.7	89.1	67	68
	Hopedale	-6.6	-1.7	62.2	134	180
APR	Goose	-4.4	-2.7	118.4	219	256
	Gander	.9	.1	71.7	84	123
	St. Johns	2.0	.9	73.1	64	60

continued next page

★ No snowfall recorded during this month

★★ Data not available at time of publication of bulletin

Table 4 (Continued)

Environmental Conditions for 1982 International Ice Patrol Season

	Station	Temp °C Monthly Mean	Temp °C Diff. from Mean	Total Precip-itation (mm)	% of Normal Precipitation	% of Normal Snowfall
MAY	Hopedale	.2	-1.2	47.6	87	164
	Goose	3.5	-1.4	70.9	115	272
	Gander	6.3	-.1	104.7	168	103
	St. Johns	5.5	0.0	166.7	168	9
JUN	Hopedale	3.6	-2.9	35.6	49	11
	Goose	9.9	-1.2	97.7	120	★
	Gander	9.2	-2.2	77.0	101	★
	St. Johns	7.0	-3.4	154.9	175	★
JUL	Hopedale	11.4	.6	39.0	45	★
	Goose	15.7	-.1	78.6	77	★
	Gander	15.4	-1.1	81.5	105	★
	St. Johns	15.6	.3	53.6	65	★
AUG	Hopedale	10.5	-.6	127.9	148	★
	Goose	14.0	-.5	112.9	122	★
	Gander	15.5	-.3	38.2	38	★
	St. Johns	15.4	0.0	110.6	98	★
SEP	Hopedale	6.6	.7	70.4	96	★
	Goose	9.0	-.8	92.7	122	8
	Gander	11.8	0.0	105.6	126	★
	St. Johns	12.6	.7	251.4	244	★

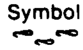
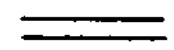
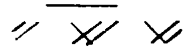
★ No snowfall recorded during this month

★ ★ Data not available at time of publication of bulletin

Table 5

Sea Ice Symbols

These symbols are from the International System of Sea Ice Symbols adopted by the World Meteorological Organization (WMO) and the Intergovernmental Maritime Consultative Organization (IMCO). They are used in Figures 1-10, Sea Ice Conditions, of this report.

Type	Thickness	Symbol
Strips and Patches	....	
New Ice	....	* * *
Close Pack Ice	....	
Young Ice	10-30 cm	
First Year Ice	30-200 cm	

Discussion of Ice Conditions

September - December 1981

No sea ice formed south of 65° N during the months of September and October. Due to above normal air temperatures and precipitation during the last quarter of 1982, the formation of sea ice along the coast was later than normal. By the end of November, the ice had extended only down along the Labrador coast to the northern shores of Frobisher Bay, with some isolated ice forming around Cape Chidley (Figure 1). The sea ice continued to move southward during December. At the end of the month, the ice edge began at Cape St. Francis and extended in a northwesterly direction, about 100 miles off the eastern shores of Newfoundland and Labrador (Figure 2).

January - February 1982

January was a quiet month for iceberg activity. As indicated in Figures 3 and 4, sea ice concentrations continued to increase along the Newfoundland and Labrador coasts as temperatures dropped below normal (see Table 4). Although the southern limit of the sea ice receded slightly during January, the density of the pack increased considerably as several major storms passed through the area bringing high winds and record low temperatures. By 23 February, the ice edge had moved southward to 47° N. Commander, International Ice Patrol received iceberg sighting reports from several ships but they were all north of 53°50'N.

March 1982

Ice Patrol reconnaissance flights were flown on the 2nd, 11th and 12th of the month. North of 48°N, IIP observed icebergs approaching the Grand Banks area. Therefore, the regular Ice Patrol season was opened on 13 March. Ten more reconnaissance flights were flown over the course of the month. 156 icebergs were sighted during the month, 17 of which drifted below 48°N. By the end of the month, 87 icebergs remained on computer plot. Figures 11 and 12 show the estimated iceberg concentration on the 15th and 30th of the month, respectively. Cold temperatures persisted in Newfoundland and Labrador, with temperatures ranging from 1° to 4°C below normal in most areas, and the sea ice continued to move south as illustrated in Figure 5.

April 1982

The sea ice began to retreat northward while at the same time it extended farther eastward than any other time this year (Figure 6). Temperatures for Labrador and Newfoundland remained below normal. An estimated 61 icebergs drifted south of 48°N which is below average for April (see Table 1). The iceberg conditions on 15 and 30 April are shown in Figures 13 and 14, respectively, and by the end of the month, only 37 icebergs remained on computer plot.

May 1982

The sea ice continued it's northward retreat this month as the weather remained wet and unsettled over Newfoundland and Labrador. By the end of the month, the coast of Newfoundland was nearly ice-free (Figure 7). The southern limit of icebergs also receded slightly, and by the end of the month, the eastern limit of icebergs had moved significantly to the west (Figures 15 and 16). On 31 May, 121 icebergs were on computer plot.

June 1982

Sea ice continued to move northward (Figure 8); however, the unseasonably cold temperatures in Labrador during April and May did not help melt the southward drifting icebergs. The southern limit returned to below 45°N on 15 June (Figure 17). This month saw the greatest amount of berg activity south of 48°N this year, with 94 bergs drifting south of that parallel before the month's end (Table 1). By 30 June, the southern limit of iceberg activity was up above 46°N (Figure 18) and there were 115 active bergs on plot on 30 June.

July 1982

The sea ice continued its retreat northward and, by July 27th, the sea ice had retreated north of 58°N with most of the pack north of 61°N (Figure 9). The estimated southern limit of known icebergs also started to move to the north. Only 3 icebergs drifted south of 48°N during July. The northward migration of the southern limit of icebergs allowed the International Ice Patrol to concentrate more of its reconnaissance flights north of 50°N. Consequently, IIP sighted a large number of icebergs between 50°N and 52°N (Figures 19 and 20). By the end of the month, there were 87 active icebergs remaining on computer plot.

August - September 1982

By 24 August, all sea ice south of 65°N had melted, with the exception of an area of 1-3 tenths concentration along the Labrador coast at 62°N (Figure 10). Iceberg activity south of 52°N continued to decline (Figures 21 and 22) and no icebergs were recorded drifting south of 48°N during the month. Commander, International Ice Patrol felt the iceberg threat to ships transiting the Grand Banks area had lessened enough to discontinue Ice Patrol reconnaissance flights for 1982 and the final reconnaissance flight was made on 26 August 1982. The 1982 season was officially closed on 2 September, with 23 icebergs still on computer plot. Commander, International Ice Patrol continued to receive iceberg reports during September, but none of these icebergs posed a significant threat to Grand Banks ship traffic. These sightings were forwarded to Ice Central Ottawa, Canada which broadcast the information to North Atlantic mariners.

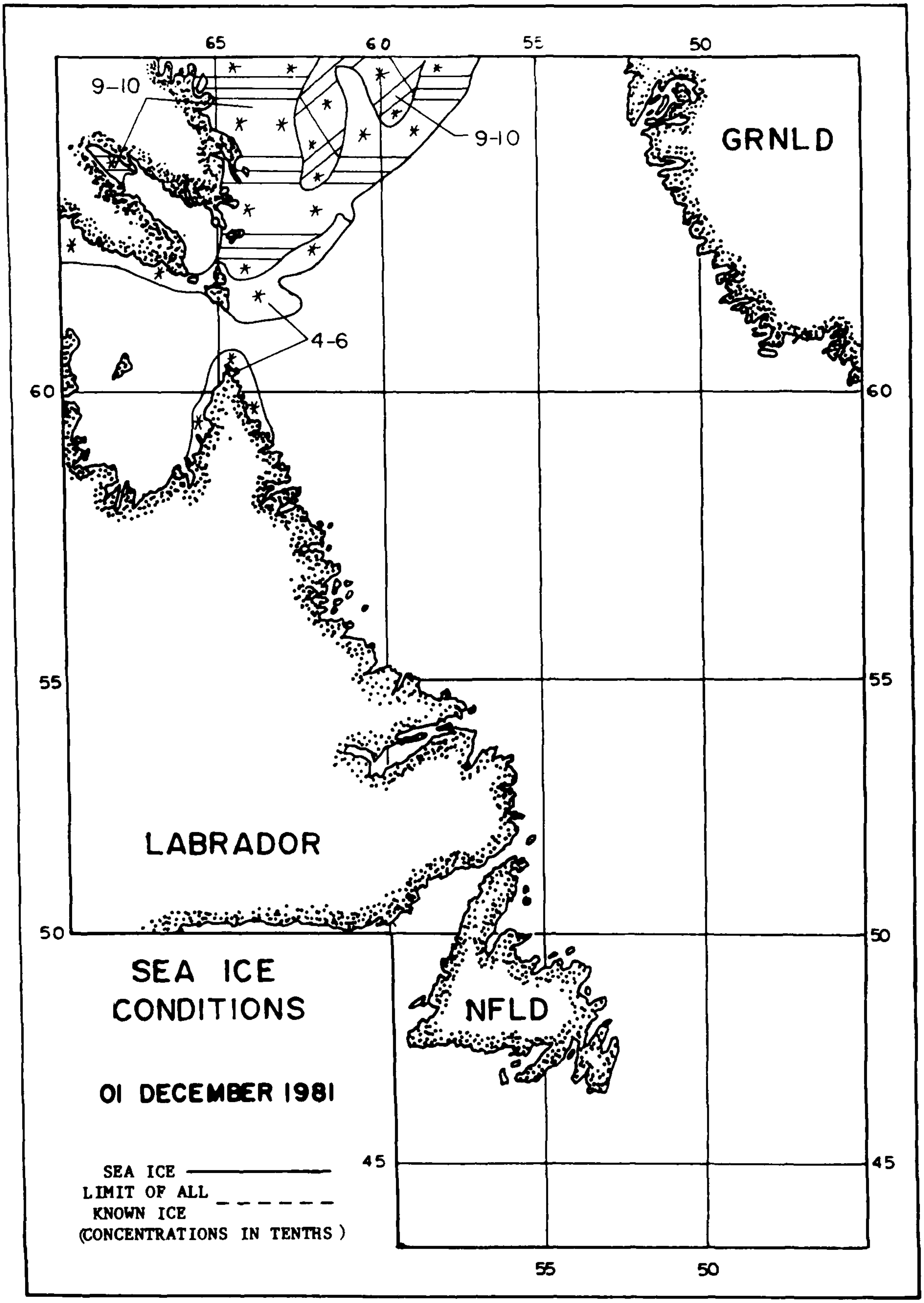

65
60
55
50
9-10
9-10
4-6
GRNLD
60
55
50
45
LABRADOR
NFLD
SEA ICE
CONDITIONS
01 DECEMBER 1981
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)

Figure 1

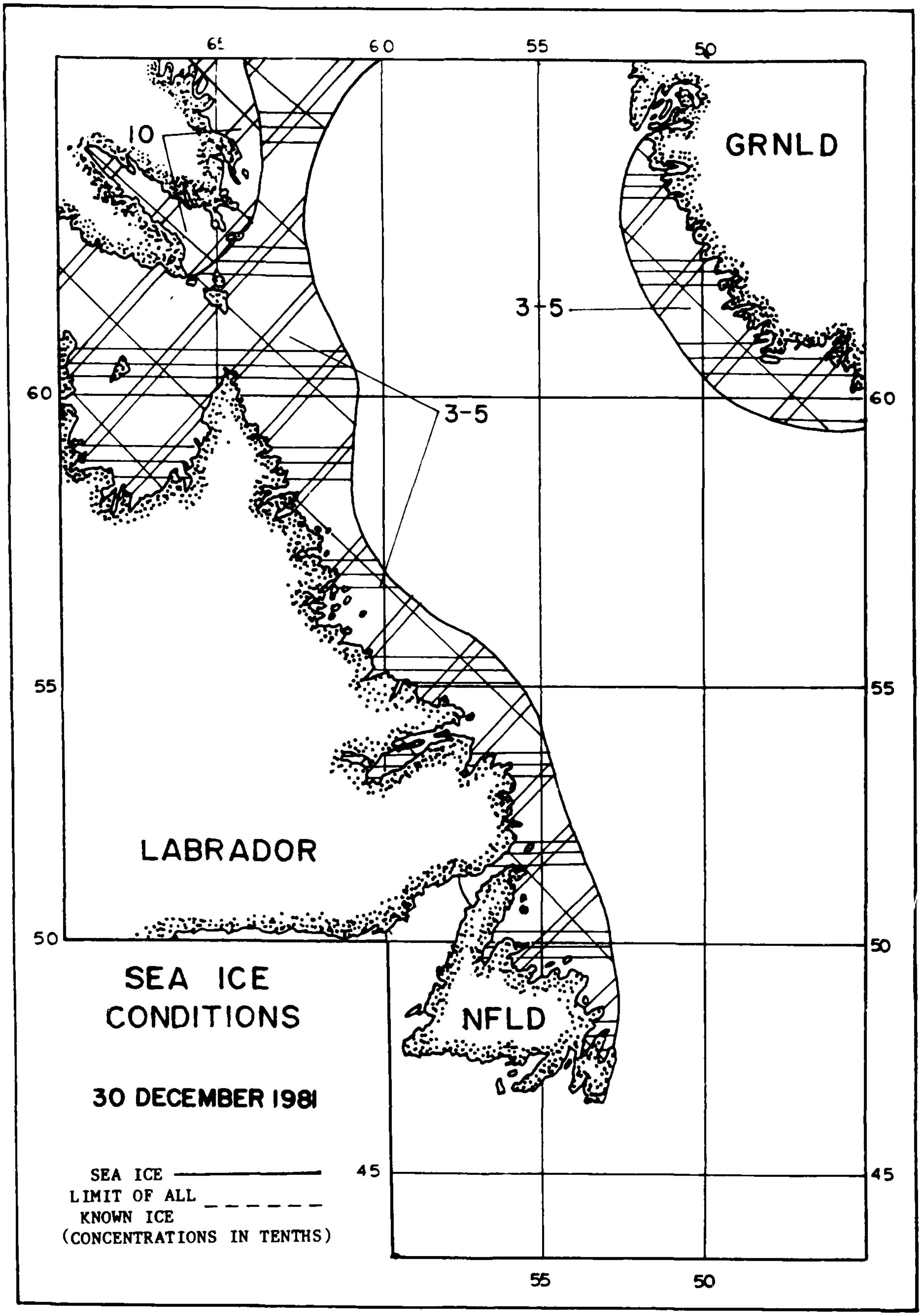

65
60
55
50
10
GRNLD
3-5
3-5
60
55
50
45
LABRADOR
NFLD
SEA ICE
CONDITIONS
30 DECEMBER 1981
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)

Figure 2

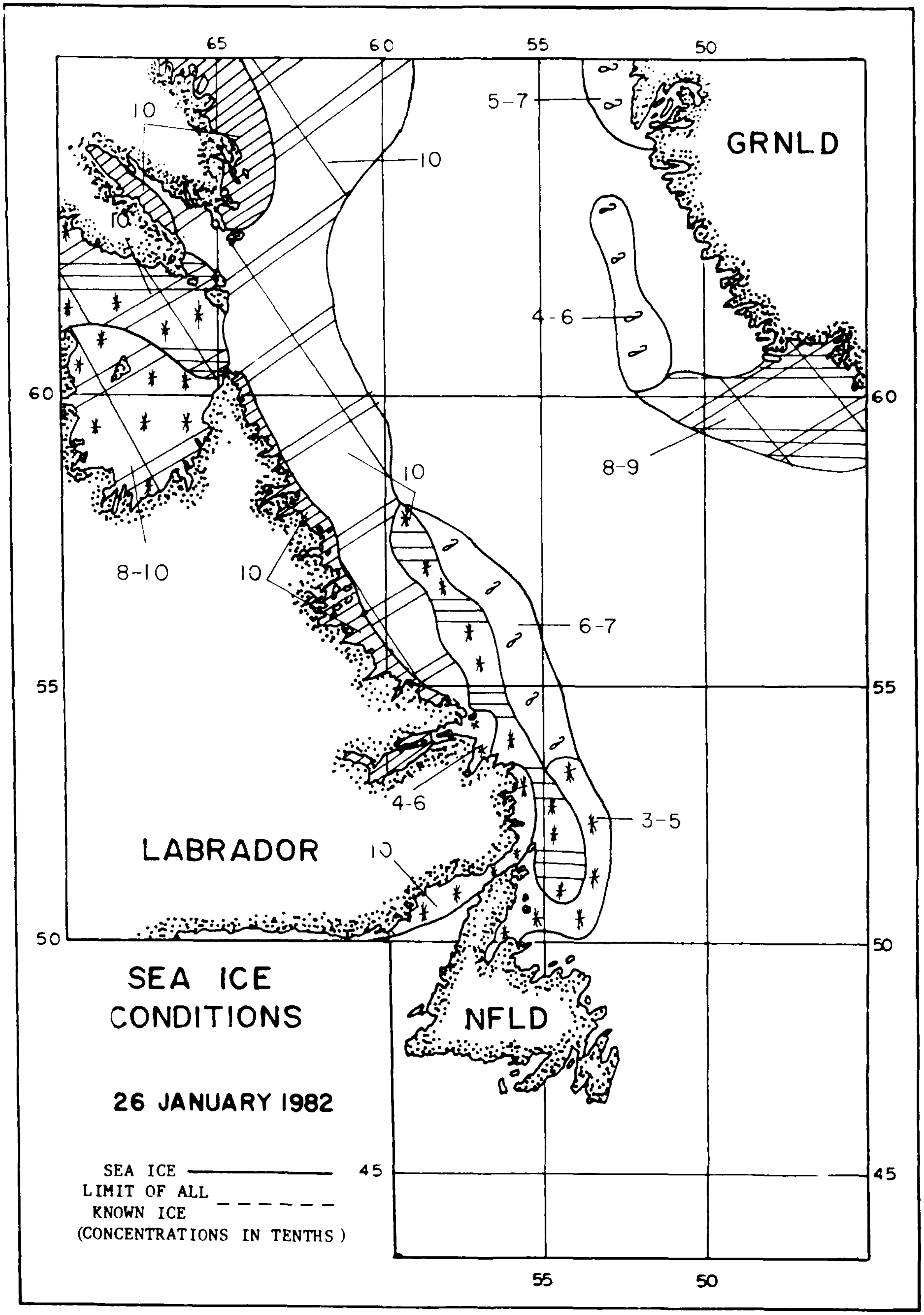

65
60
55
50
10
10
5-7
GRNLD
10
4-6
60
60
8-9
10
8-10
10
6-7
55
55
4-6
3-5
LABRADOR
10
50
50
SEA ICE
CONDITIONS
NFLD
26 JANUARY 1982
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45
55
50

Figure 3

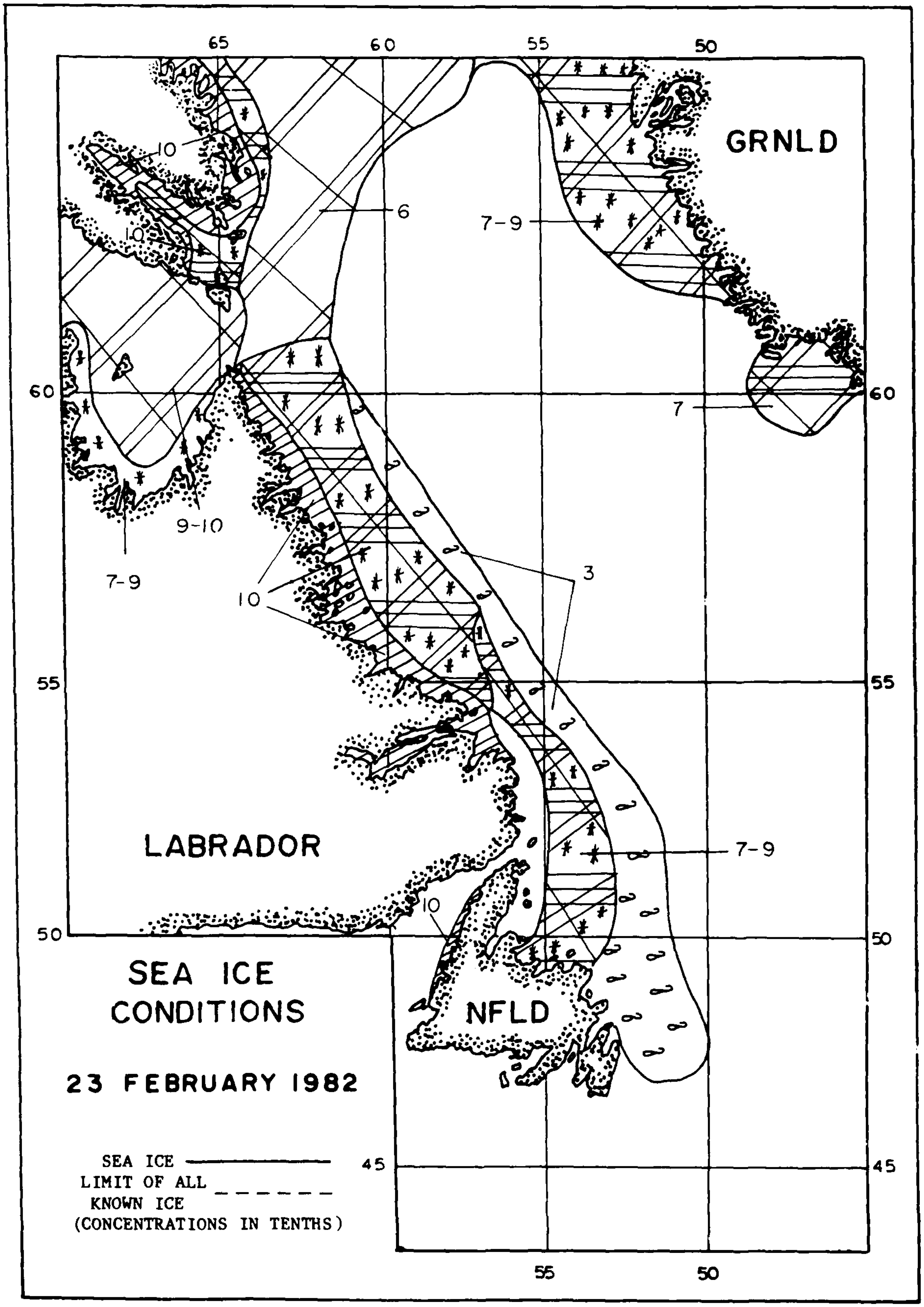

65
60
55
50
GRNLD
10
10
6
7-9
60
60
7
9-10
7-9
10
3
55
55
LABRADOR
7-9
10
50
50
SEA ICE
CONDITIONS
NFLD
23 FEBRUARY 1982
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45
55
50

Figure 4

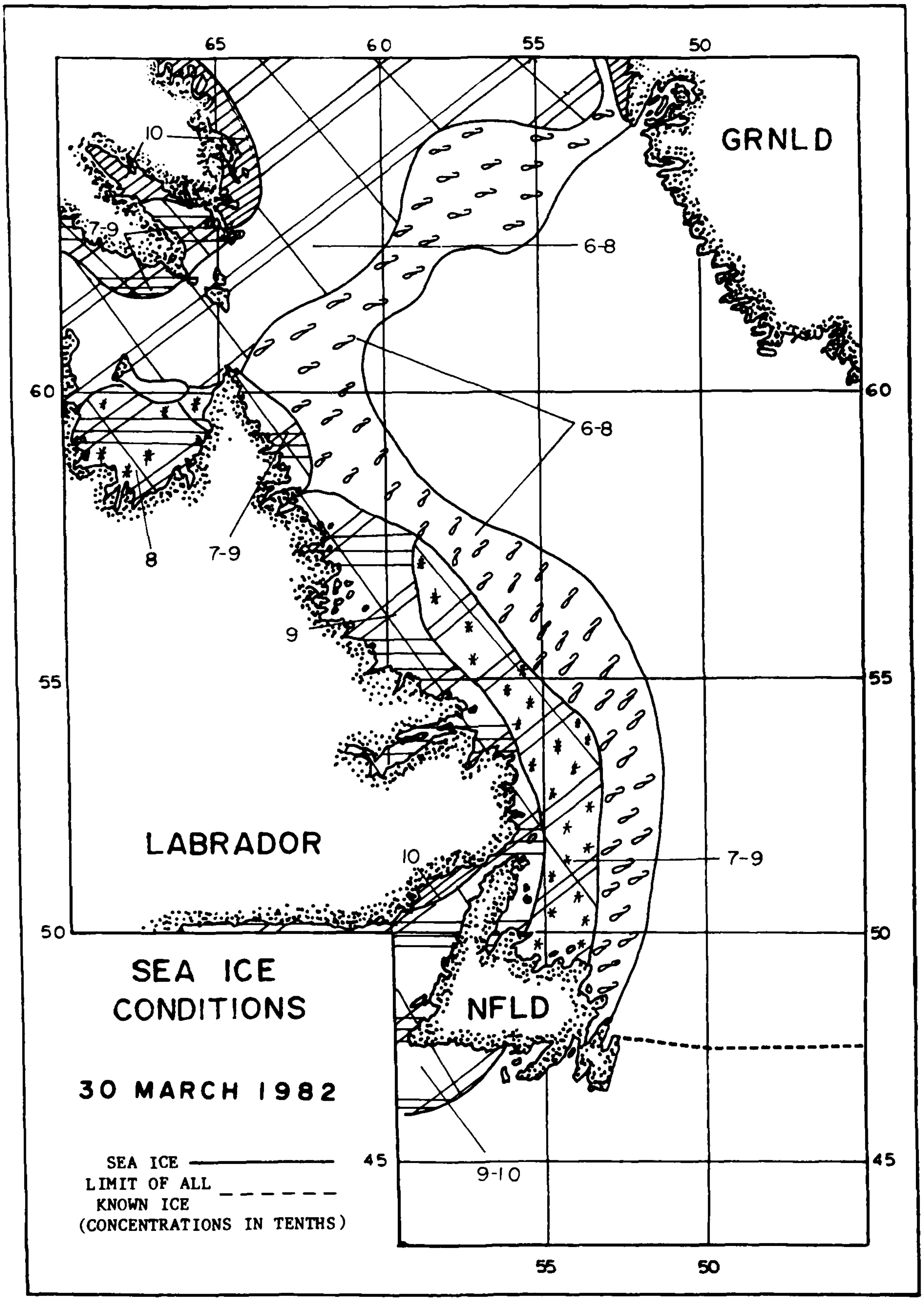

65
60
55
50
GRNLD
10
7-9
6-8
6-8
60
60
8
7-9
9
55
55
LABRADOR
10
7-9
50
50
SEA ICE
CONDITIONS
NFLD
30 MARCH 1982
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45
9-10
55
50

Figure 5

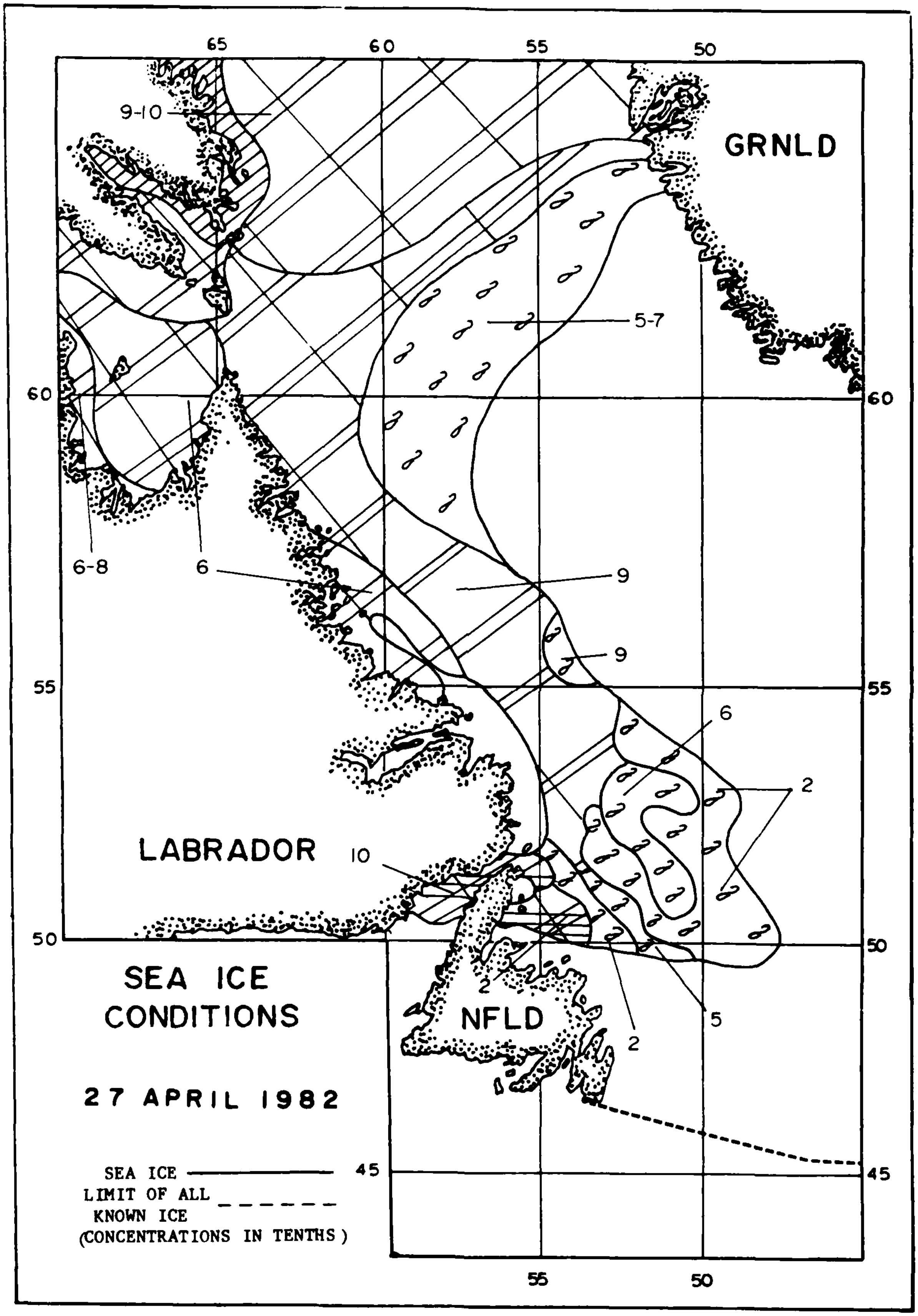

65
60
55
50
GRNLD
9-10
5-7
60
6-8
6
6
9
9
55
6
2
LABRADOR
10
2
50
SEA ICE
CONDITIONS
NFLD
2
5
27 APRIL 1982
SEA ICE
LIMIT OF ALL KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45

Figure 6

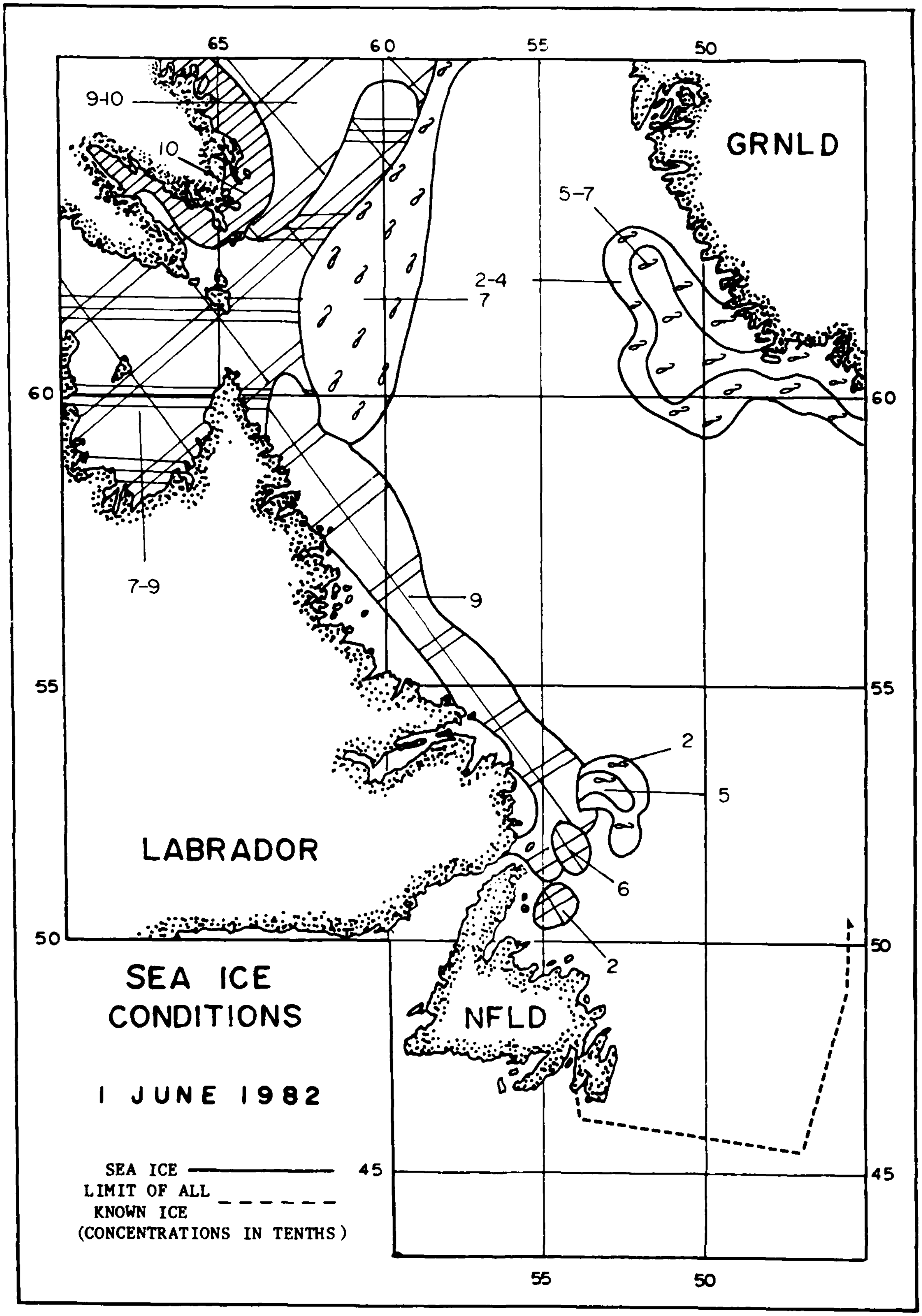

65
60
55
50
9-10
10
GRNLD
5-7
2-4
7
60
7-9
9
55
2
5
LABRADOR
6
2
50
SEA ICE
CONDITIONS
1 JUNE 1982
NFLD
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45

Figure 7

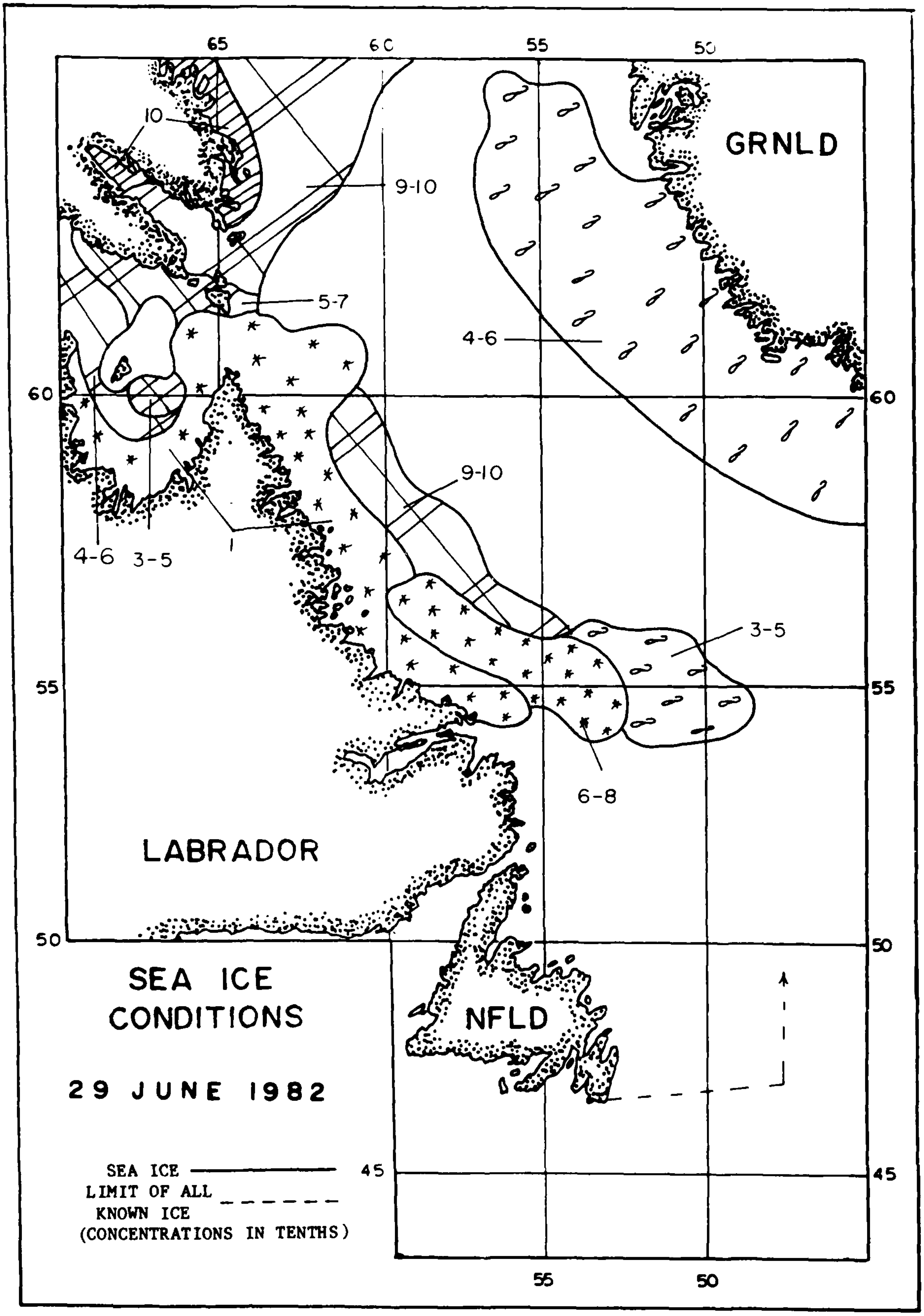

65
60
55
50
GRNLD
10
9-10
5-7
4-6
60
60
9-10
4-6
3-5
1
3-5
55
55
6-8
LABRADOR
50
50
SEA ICE
CONDITIONS
NFLD
29 JUNE 1982
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45
55
50

Figure 8

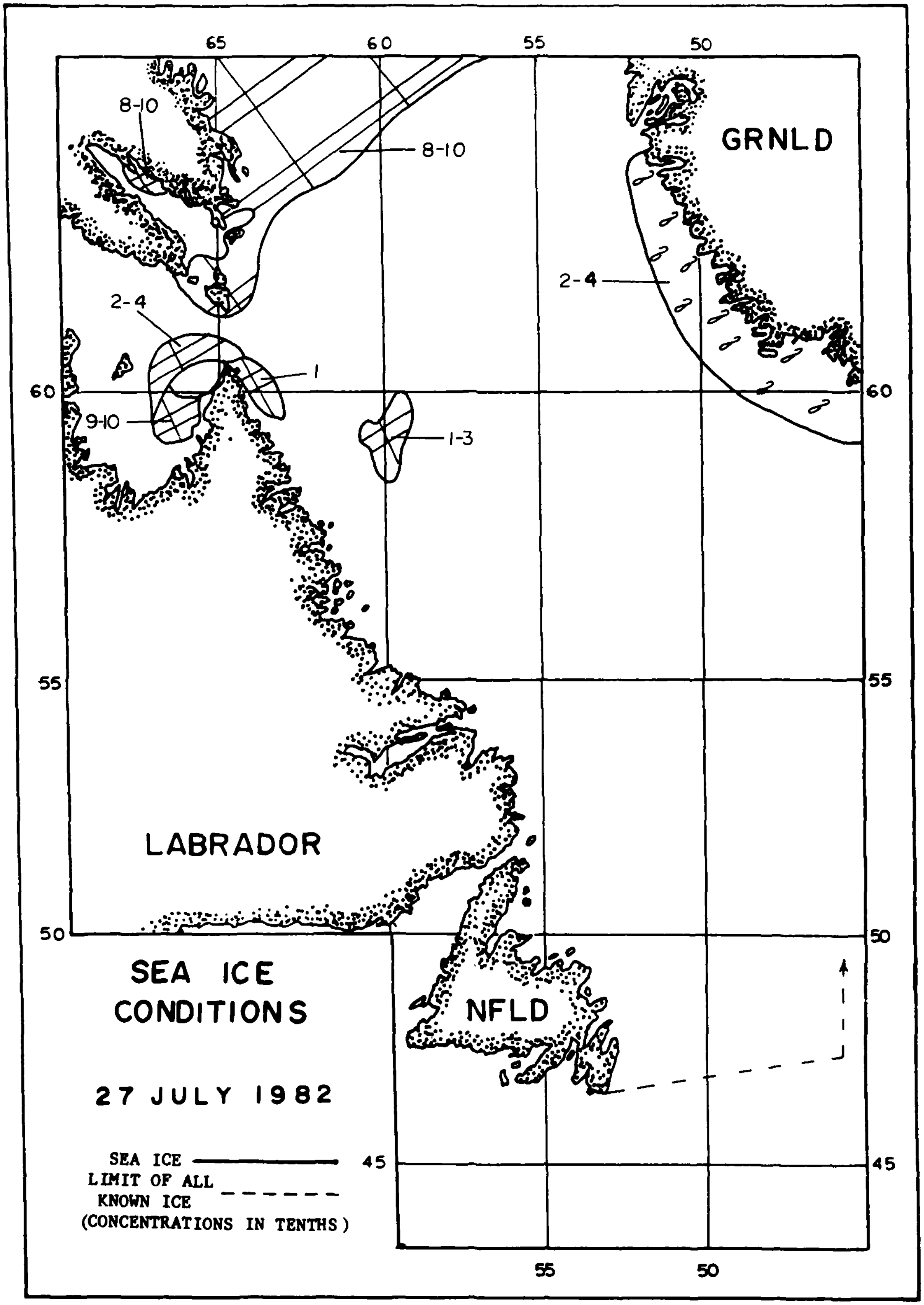

65
60
55
50
8-10
8-10
GRNLD
2-4
2-4
1
60
60
9-10
1-3
55
55
LABRADOR
50
50
SEA ICE
CONDITIONS
NFLD
27 JULY 1982
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45
55
50

Figure 9

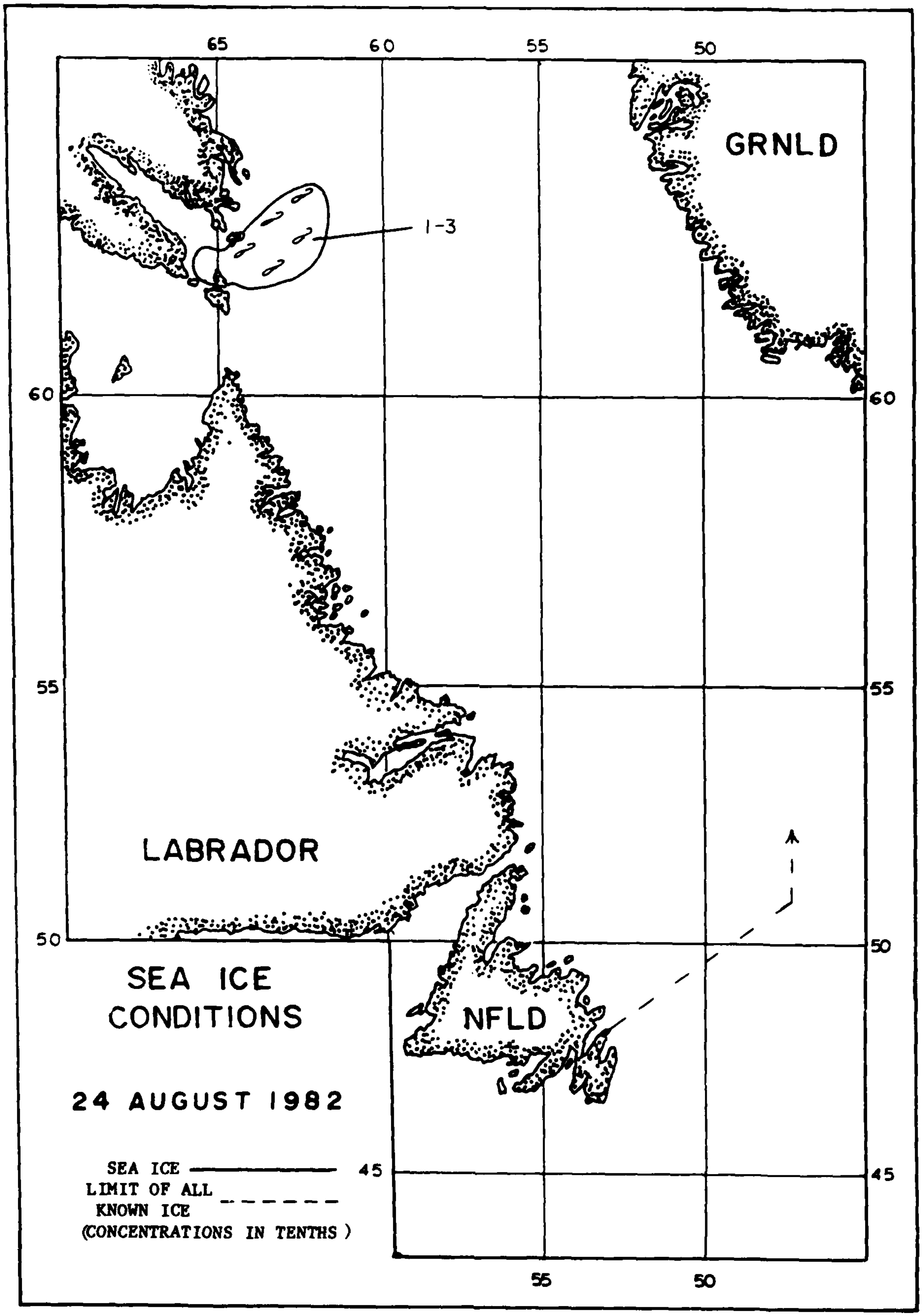
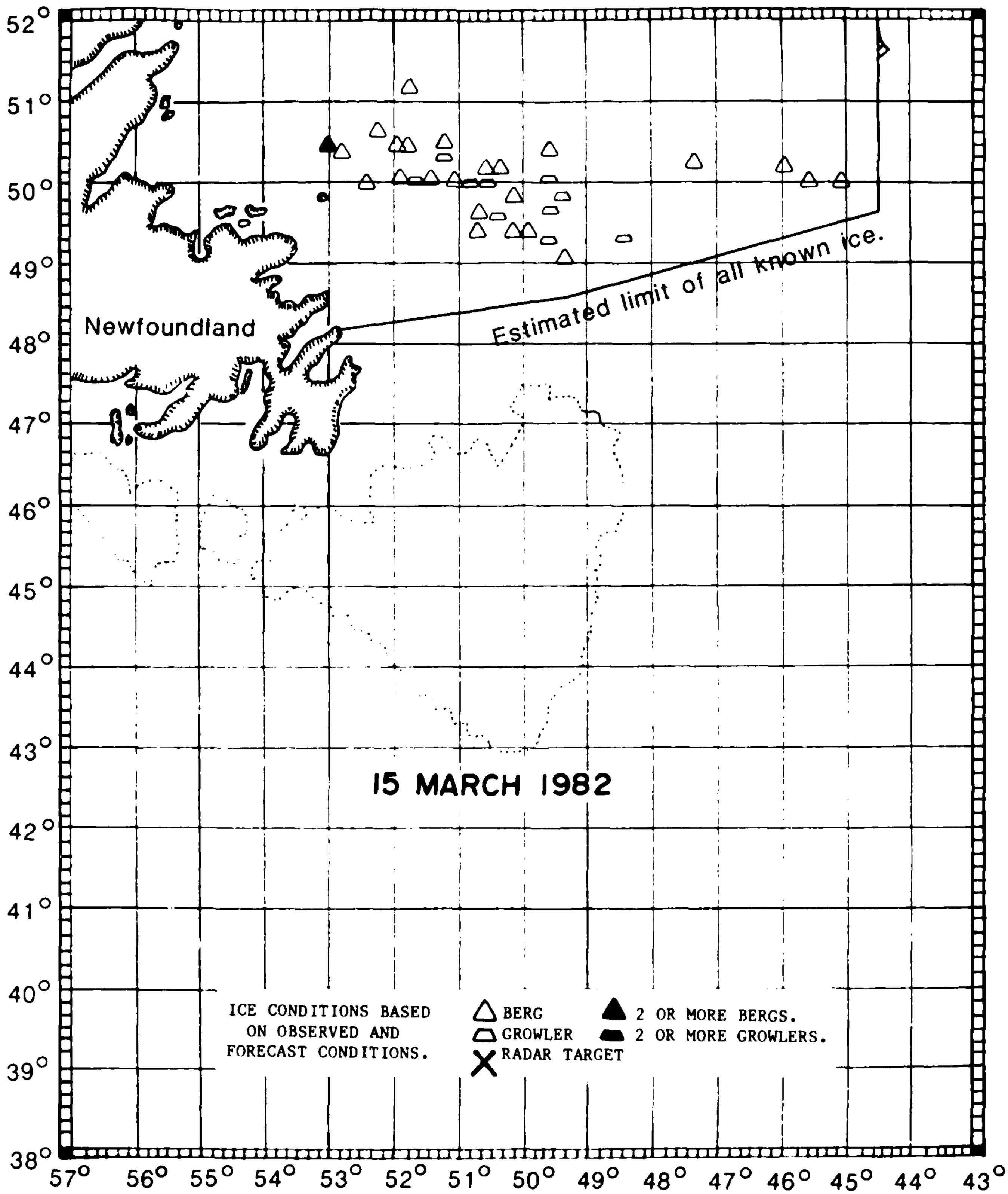

65
60
55
50
GRNLD
1-3
60
60
55
55
LABRADOR
50
50
SEA ICE
CONDITIONS
NFLD
24 AUGUST 1982
SEA ICE
LIMIT OF ALL
KNOWN ICE
(CONCENTRATIONS IN TENTHS)
45
45
55
50

Figure 10



52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
Newfoundland
Estimated limit of all known ice.
15 MARCH 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 11

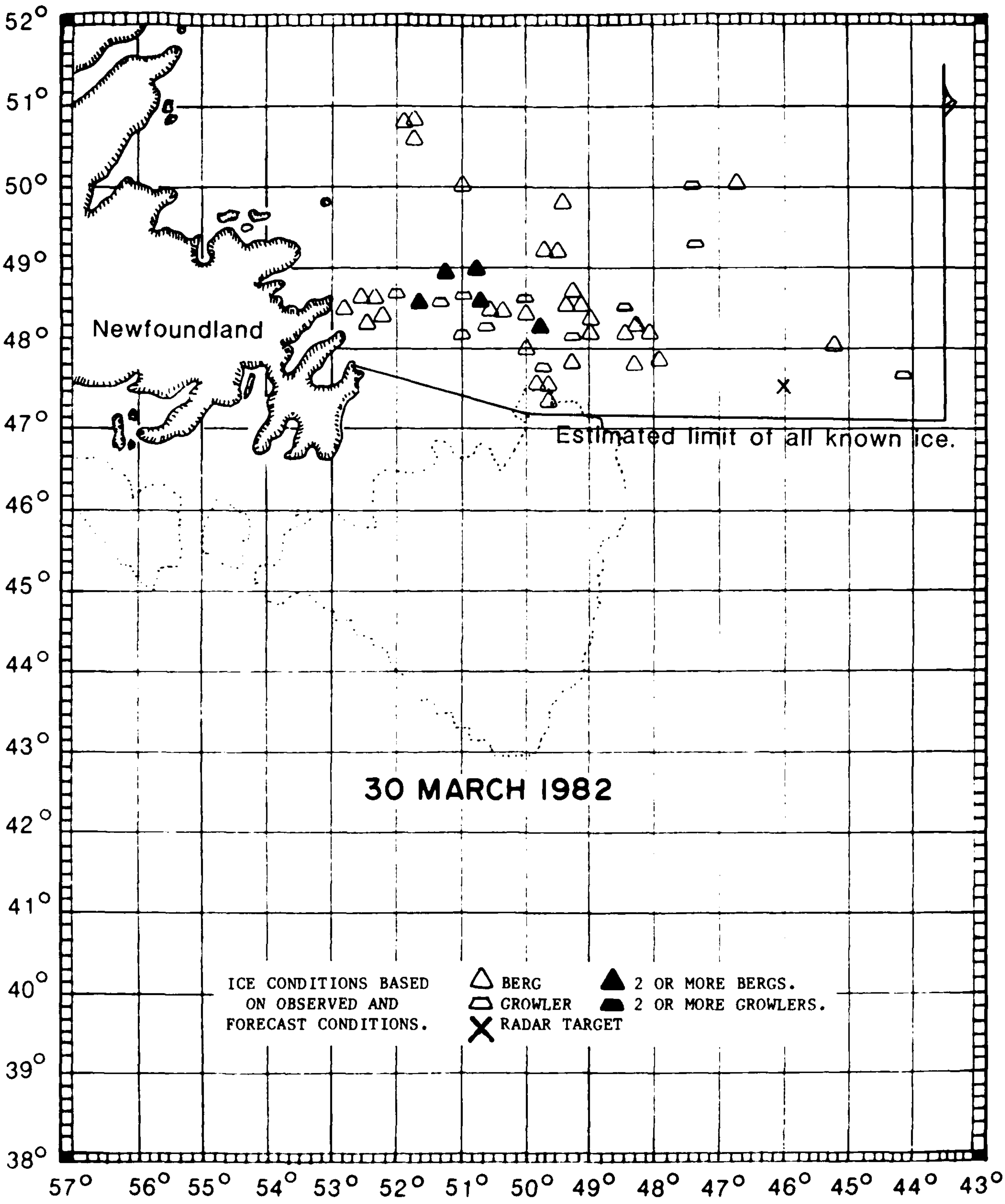
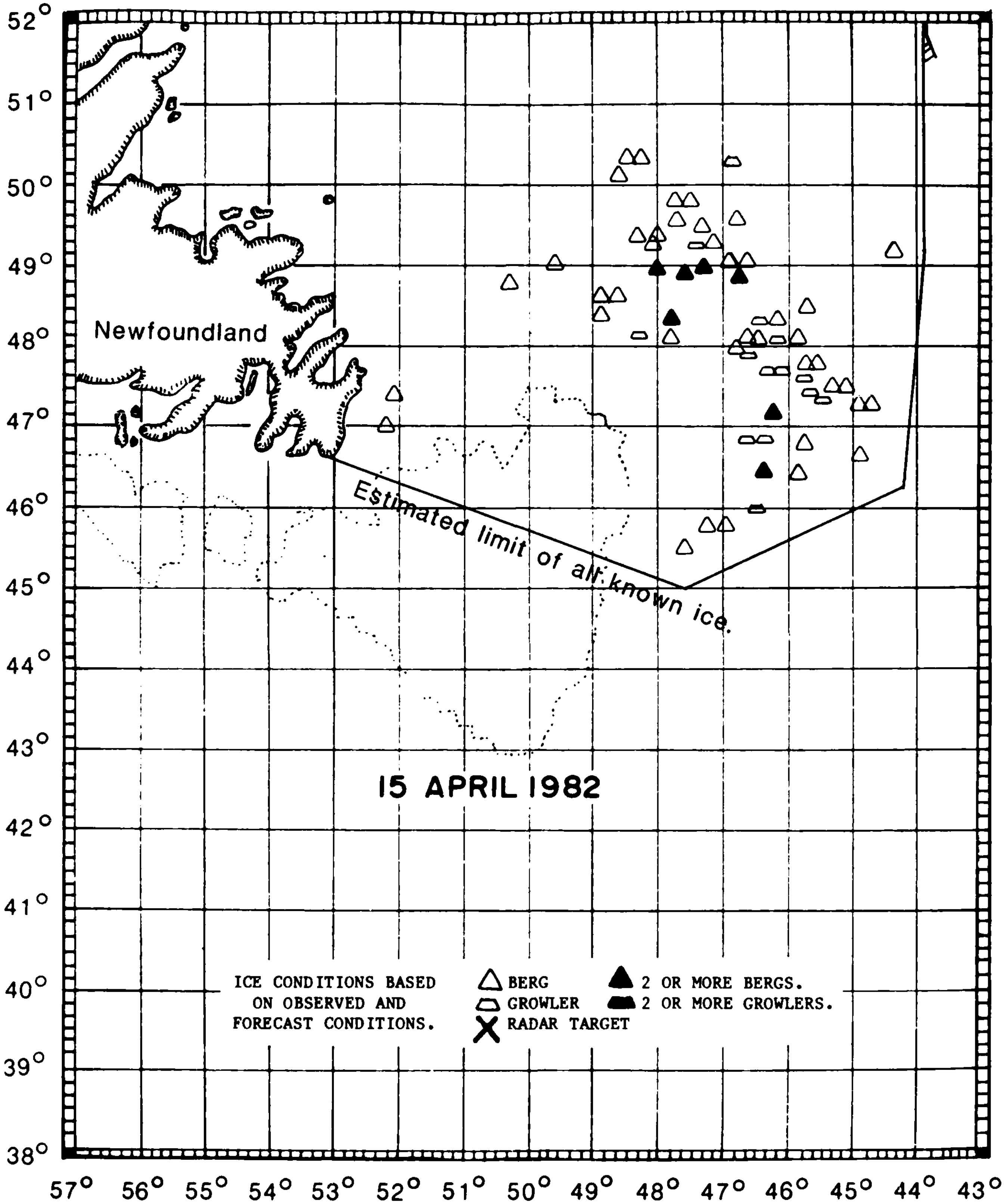

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57°
56°
55°
54°
53°
52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
Newfoundland
Estimated limit of all known ice.
30 MARCH 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 12



52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
Newfoundland
Estimated limit of all known ice.
15 APRIL 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 13

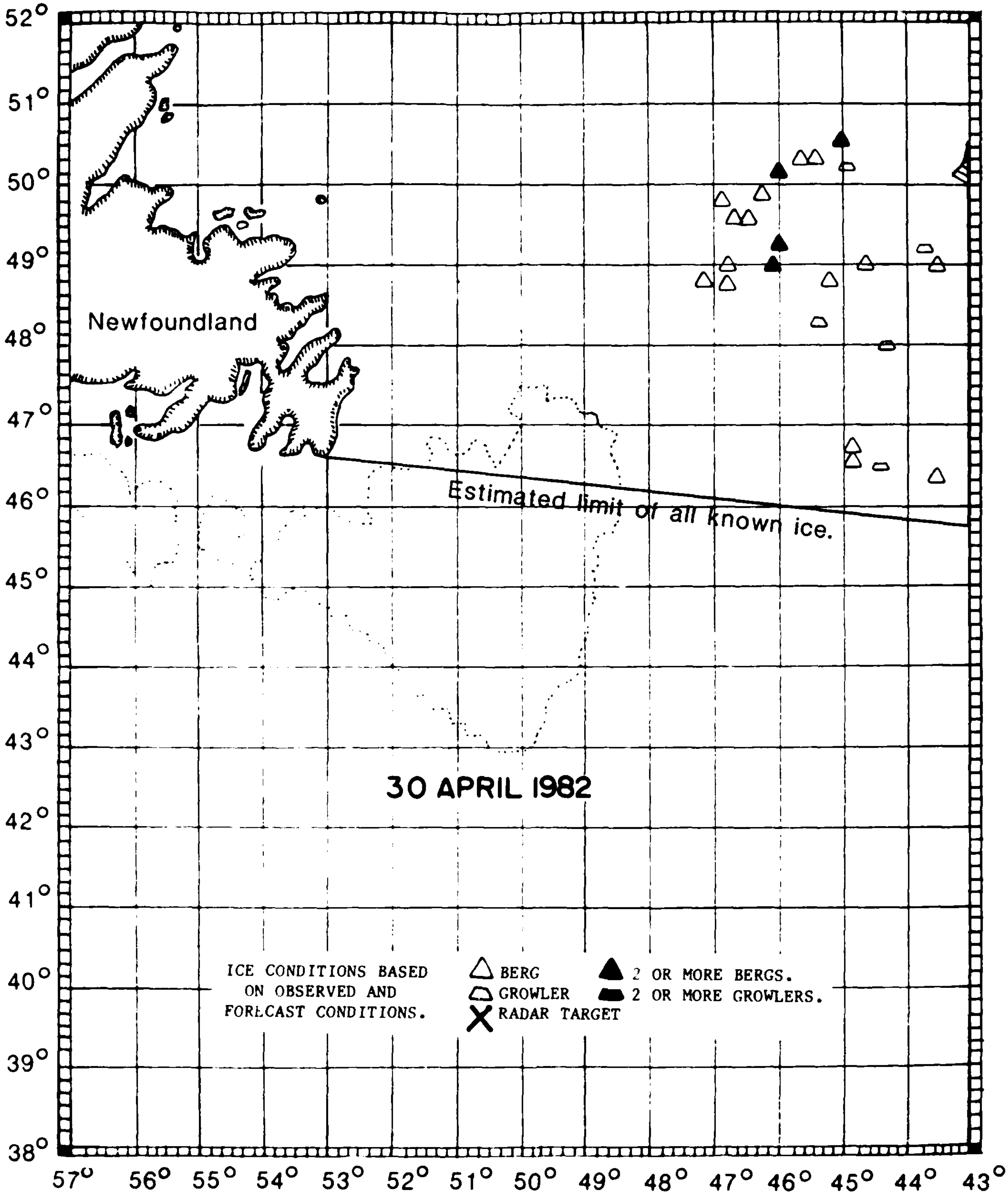

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
Newfoundland
Estimated limit of all known ice.
30 APRIL 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.
57°
56°
55°
54°
53°
52°
51°
50°
49°
48°
47°
46°
45°
44°
43°

Figure 14

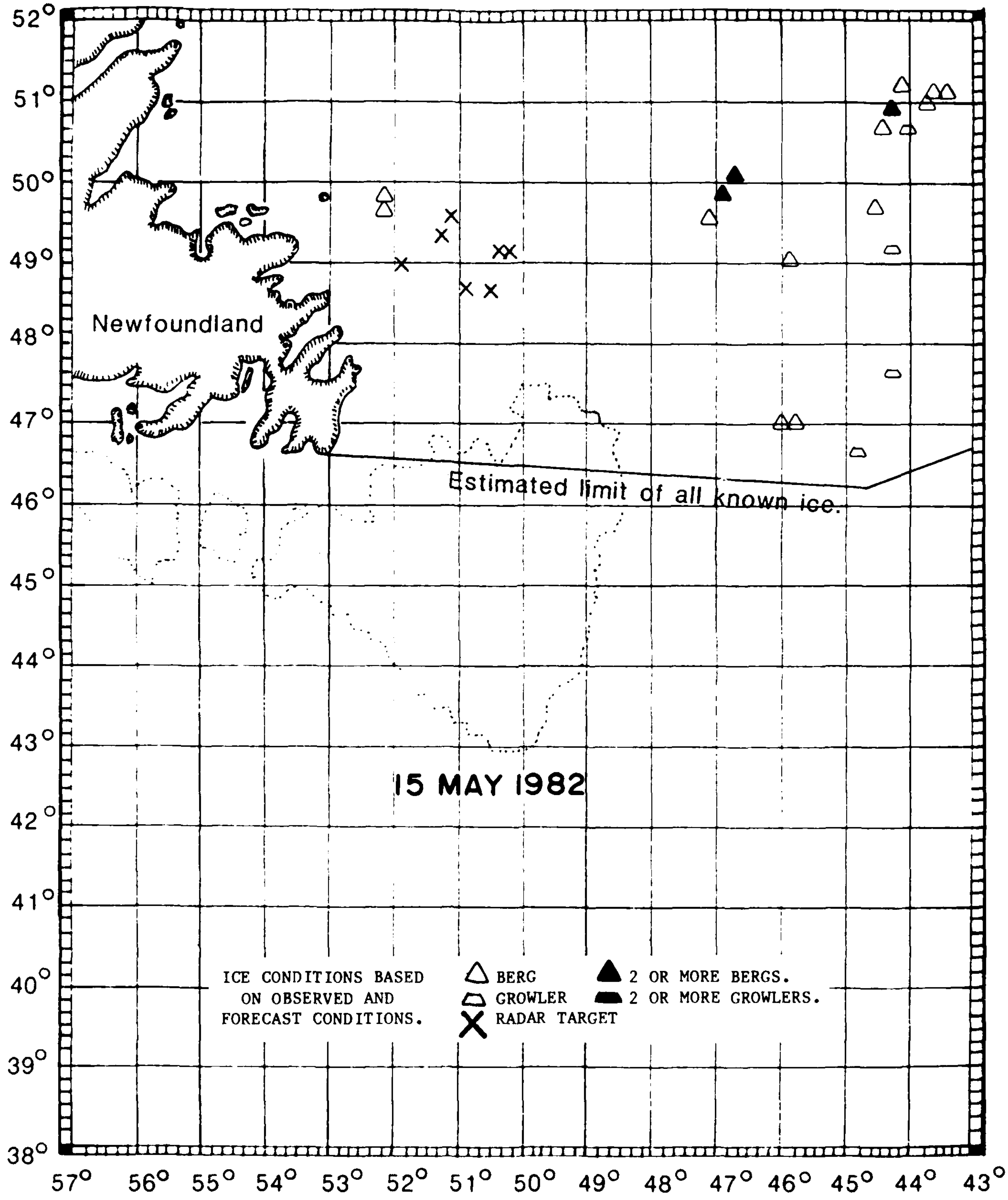

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
Newfoundland
Estimated limit of all known ice.
15 MAY 1982
ICE CONDITIONS BASED
ON OBSERVED AND
FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 15

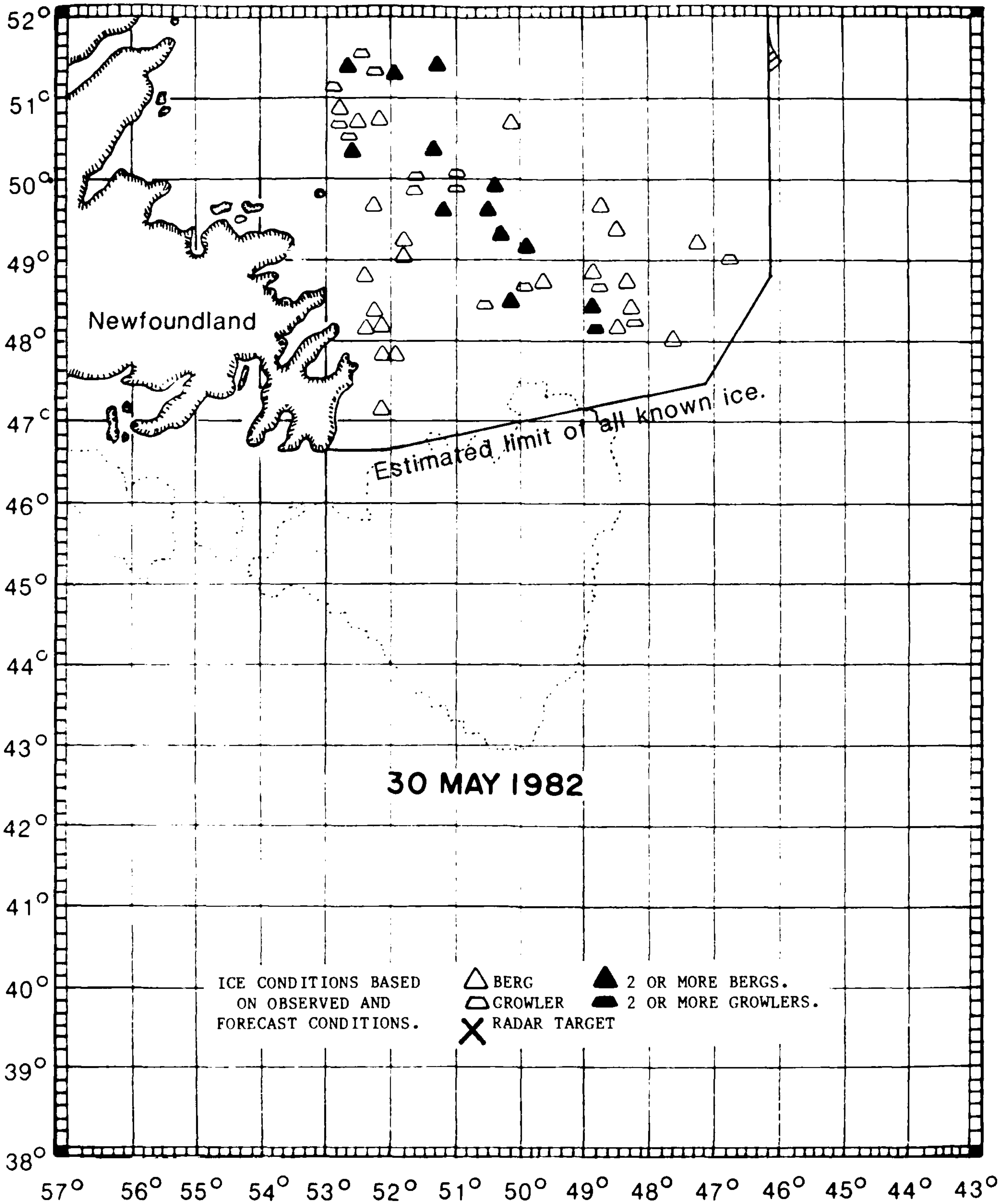
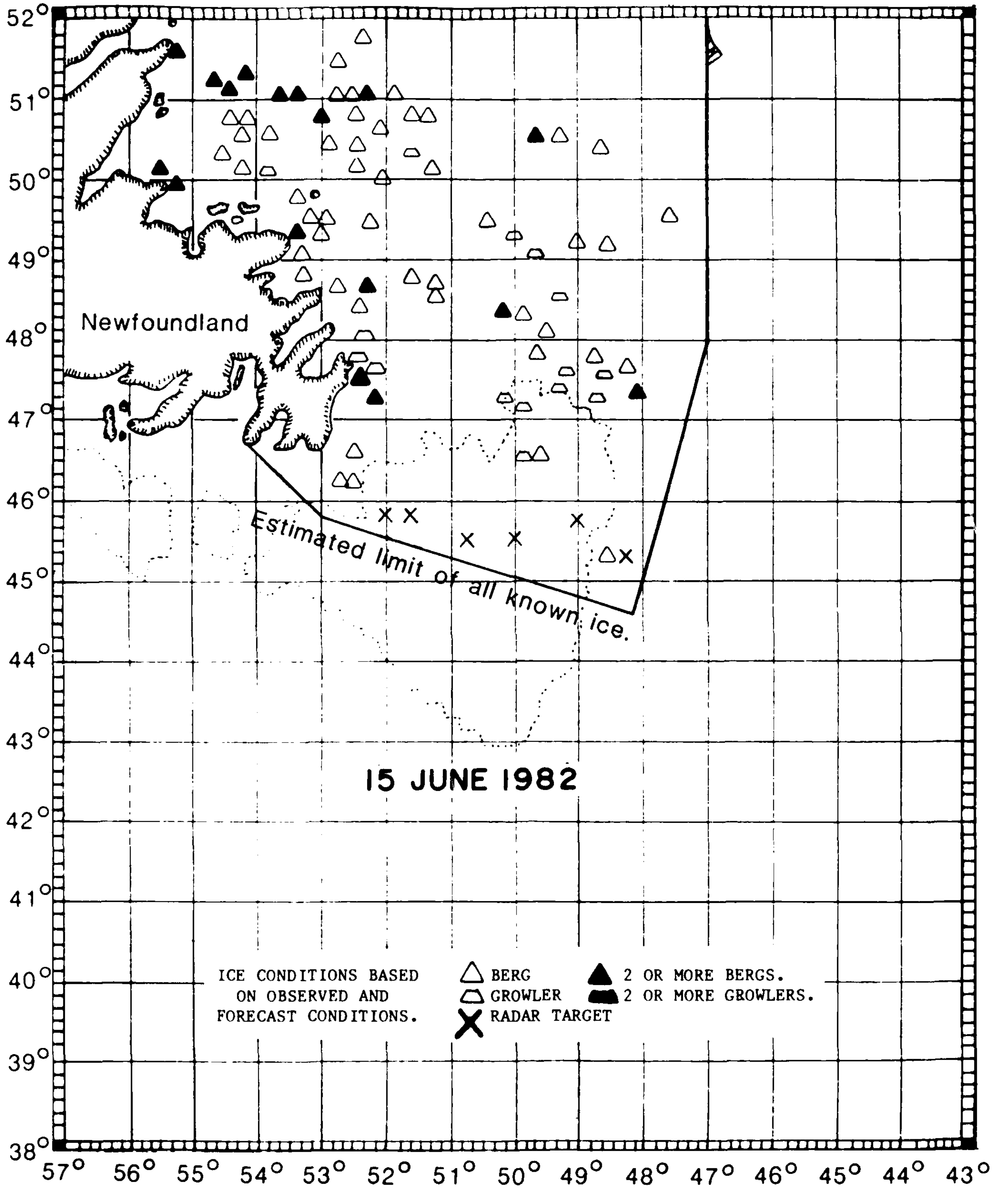

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57°
56°
55°
54°
53°
52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
Newfoundland
Estimated limit of all known ice.
30 MAY 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
CROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 16



52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57°
56°
55°
54°
53°
52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
Newfoundland
Estimated limit of all known ice.
15 JUNE 1982
ICE CONDITIONS BASED
ON OBSERVED AND
FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 17

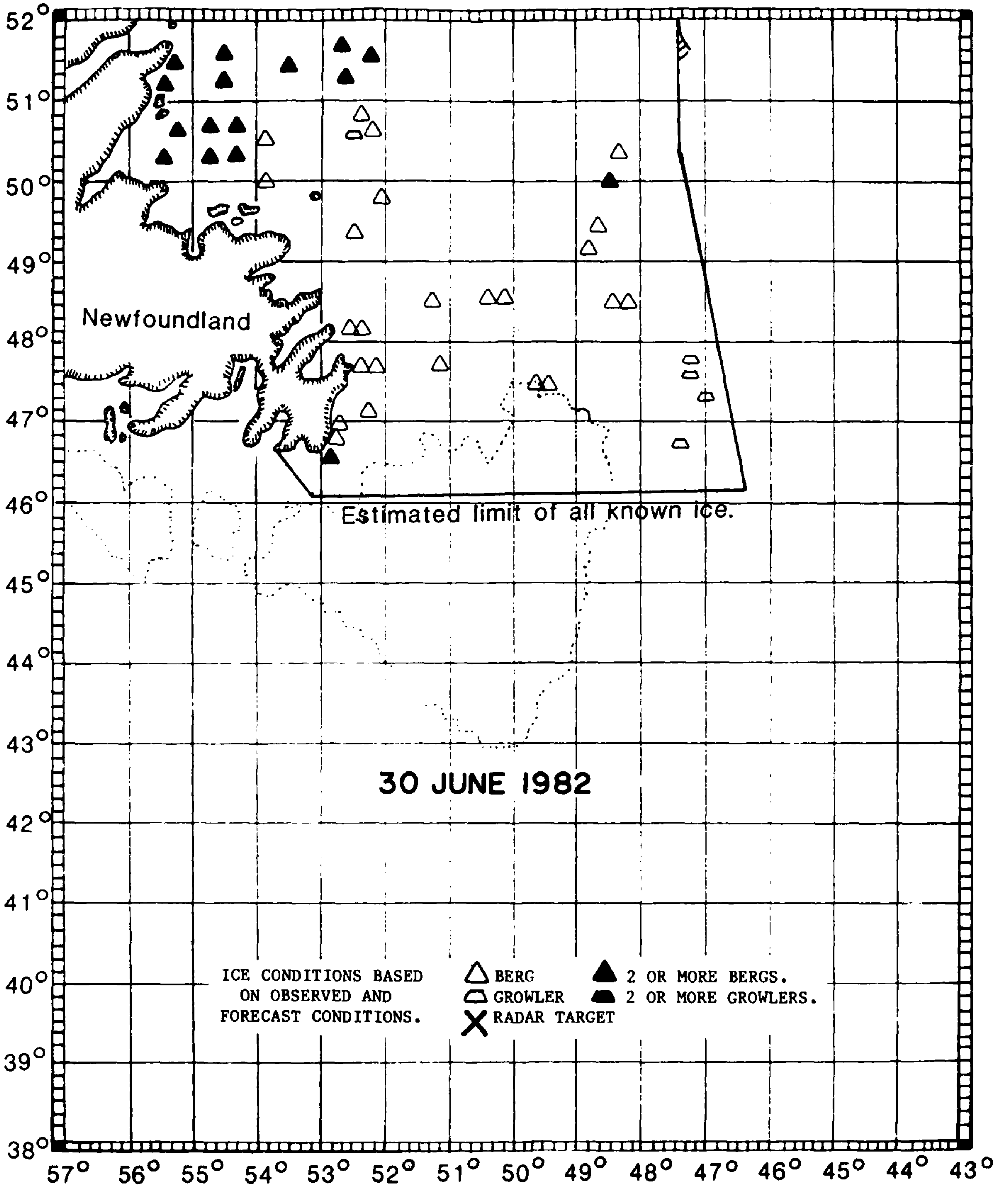

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57°
56°
55°
54°
53°
52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
Newfoundland
Estimated limit of all known ice.
30 JUNE 1982
ICE CONDITIONS BASED
ON OBSERVED AND
FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 18

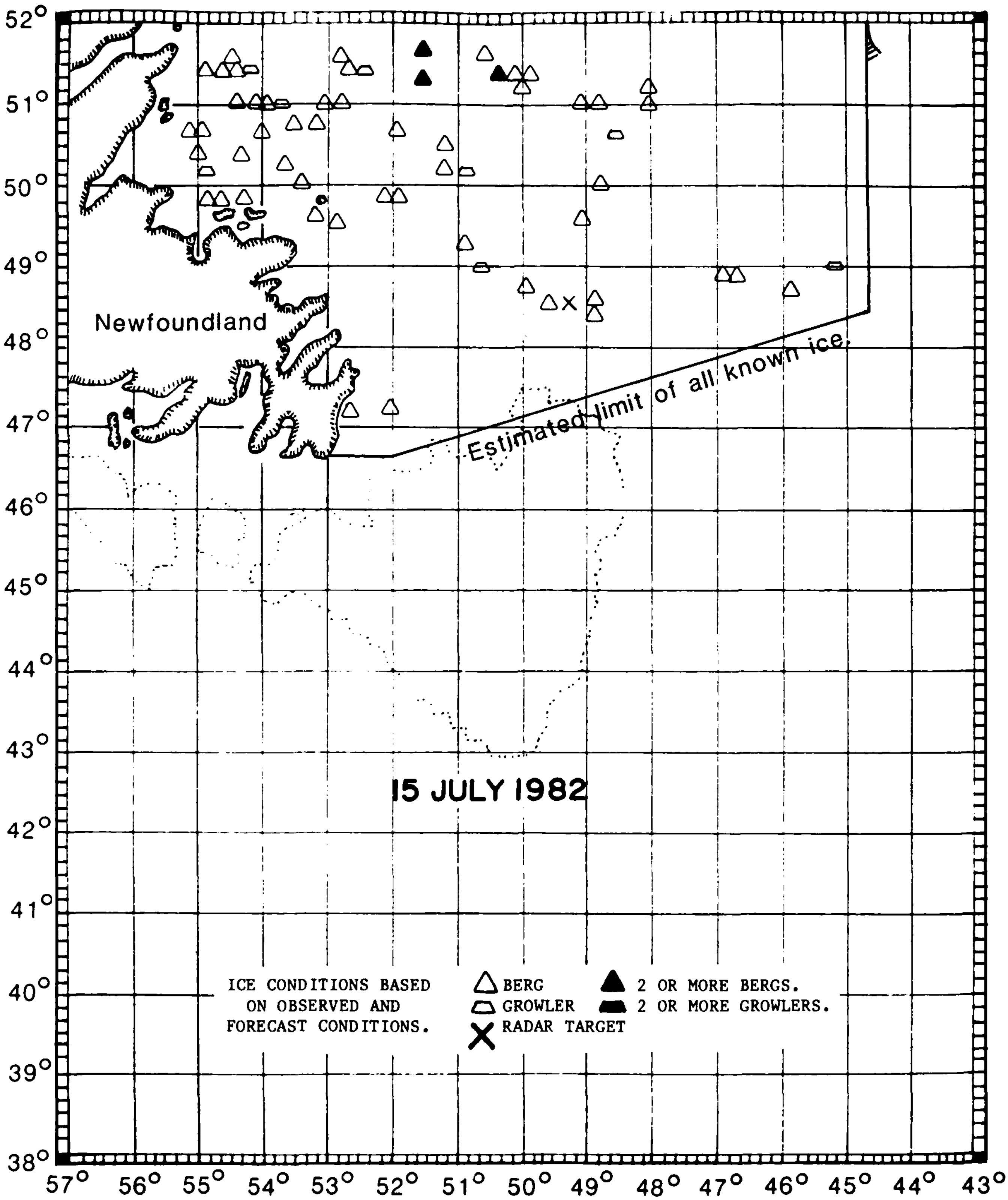

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57°
56°
55°
54°
53°
52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
Newfoundland
Estimated limit of all known ice
15 JULY 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 19

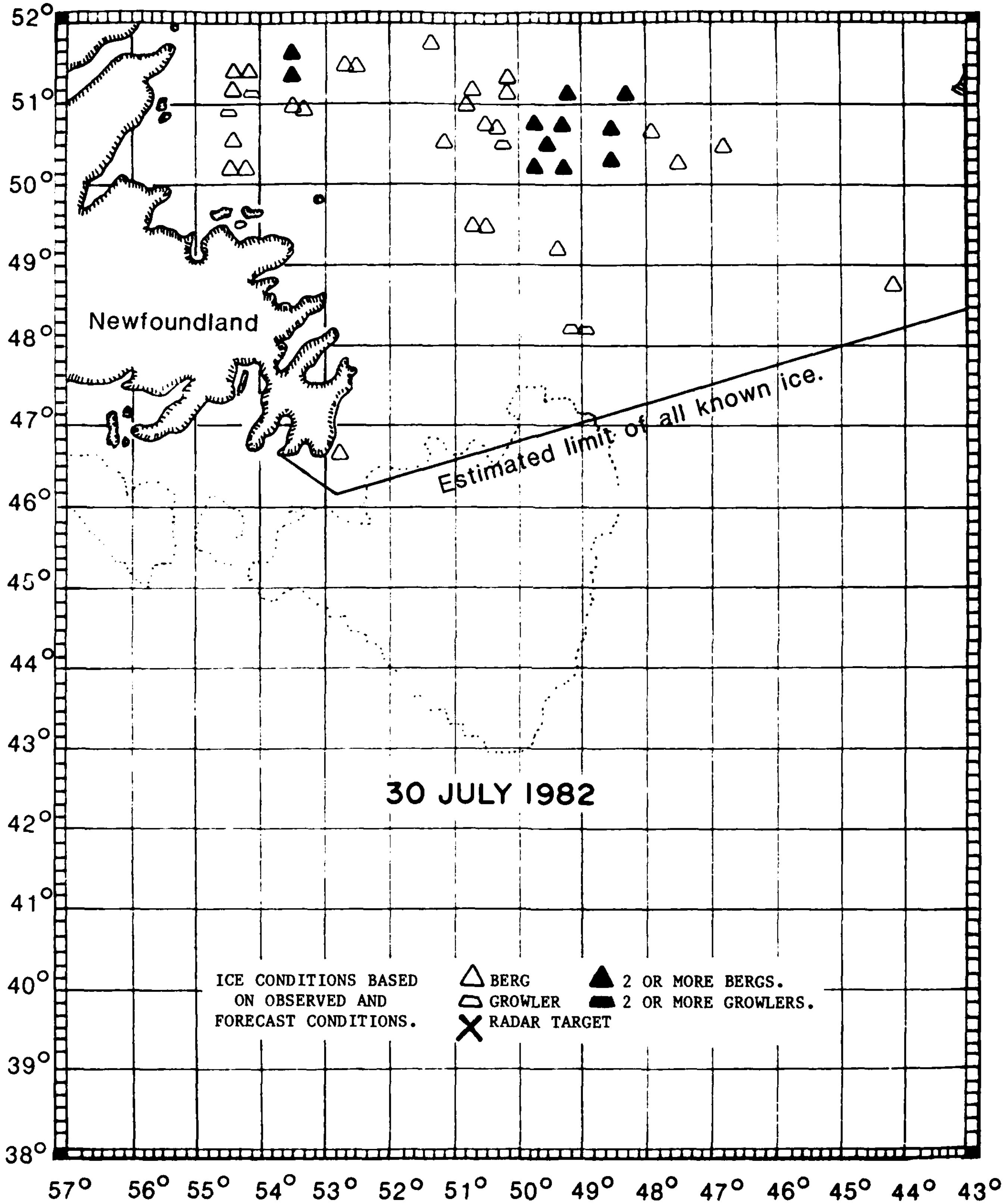

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
Newfoundland
Estimated limit of all known ice.
30 JULY 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°

Figure 20

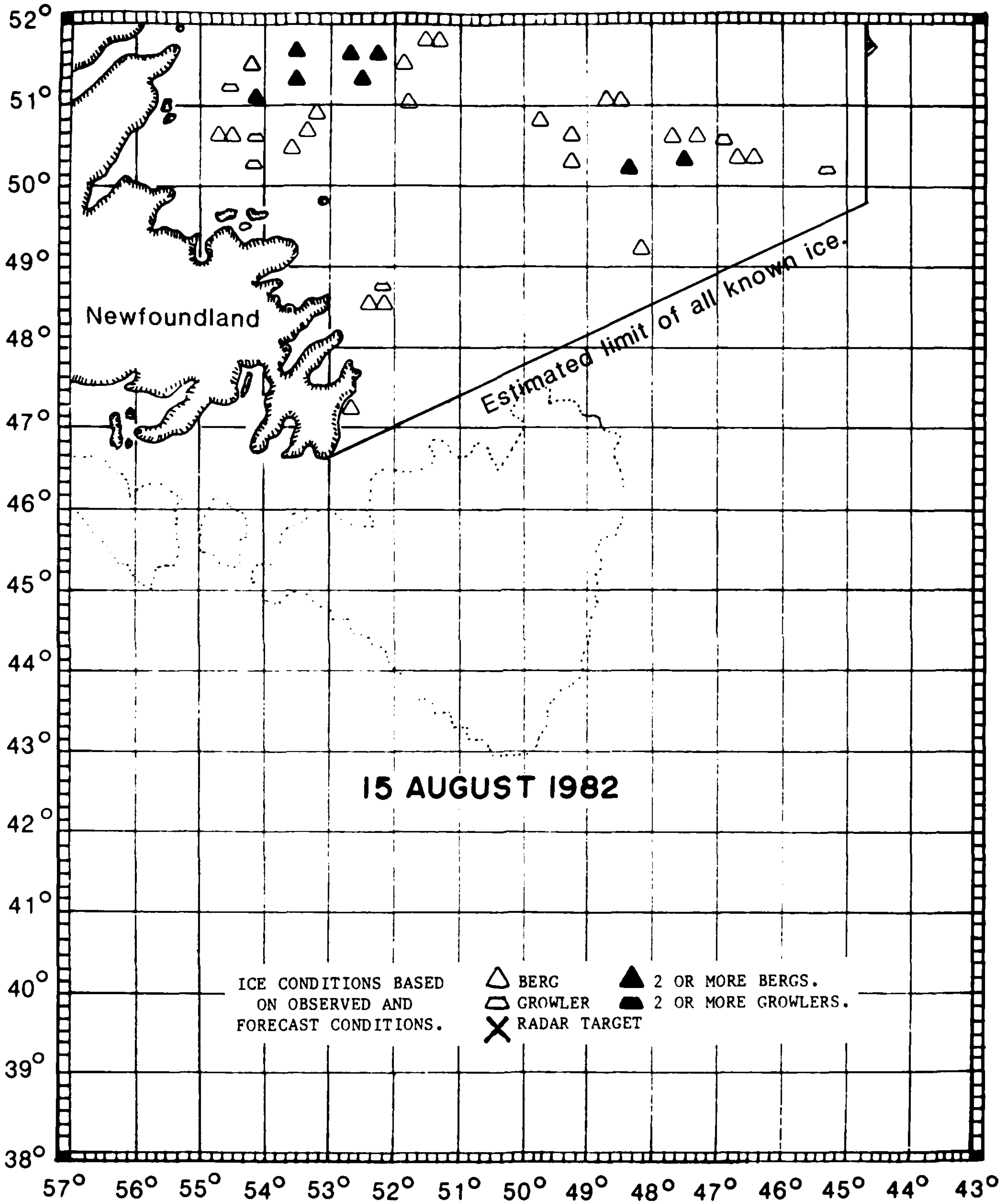

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
Newfoundland
Estimated limit of all known ice.
15 AUGUST 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 21

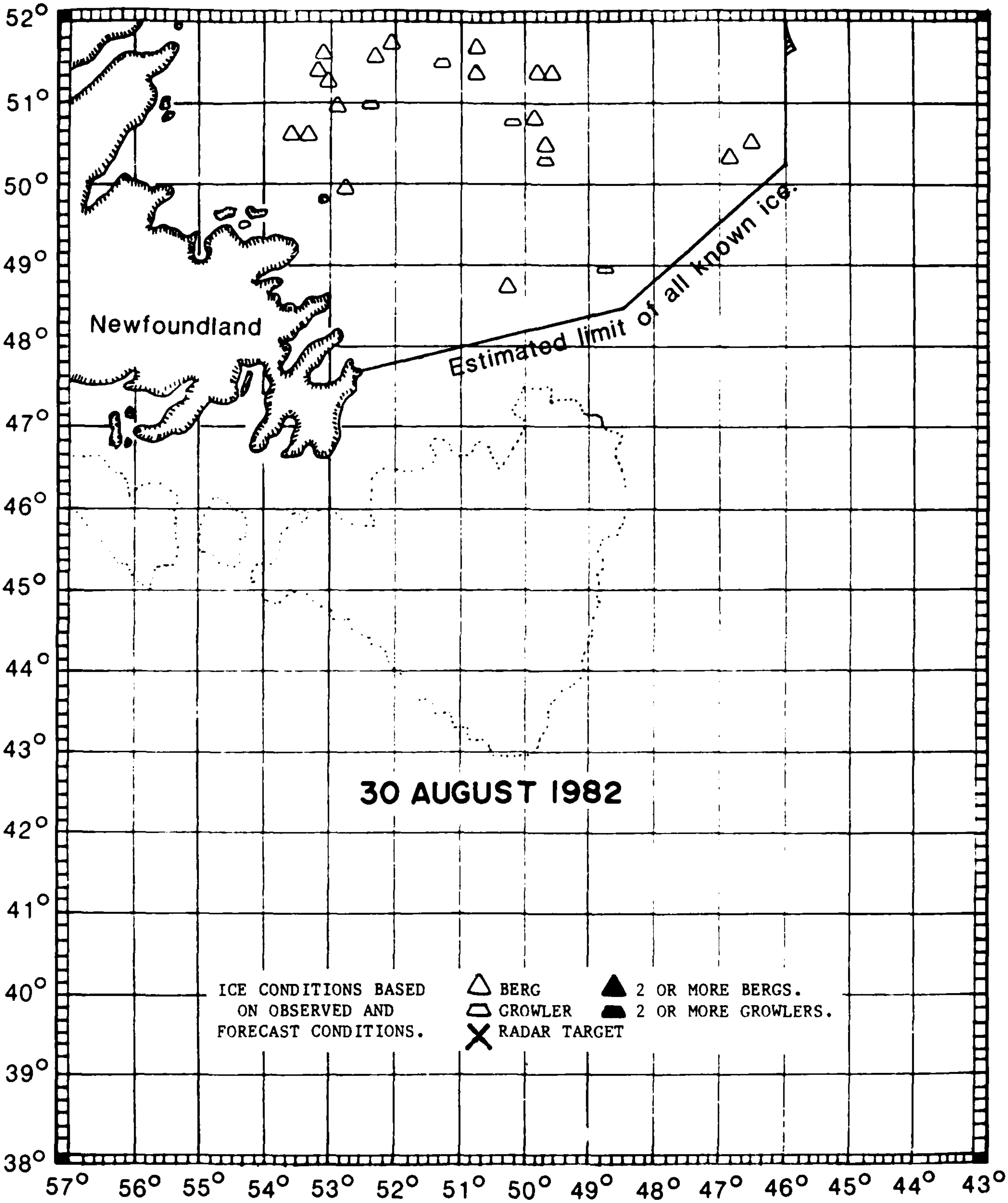

52°
51°
50°
49°
48°
47°
46°
45°
44°
43°
42°
41°
40°
39°
38°
57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43°
Newfoundland
Estimated limit of all known ice.
30 AUGUST 1982
ICE CONDITIONS BASED ON OBSERVED AND FORECAST CONDITIONS.
BERG
GROWLER
RADAR TARGET
2 OR MORE BERGS.
2 OR MORE GROWLERS.

Figure 22

Acknowledgements

The Marine Science Branch, International Ice Patrol staff, attached to U.S. Coast Guard Atlantic Area, prepares this report and acknowledges the assistance and information provided by the Canadian Department of the Environment, the U.S. National Weather Service, the U.S. Naval Weather Service, and the U.S. Coast Guard Research and Development Center.

We extend our sincere appreciation to the staffs of the Canadian Coast Guard Radio Station St. John's, Newfoundland/VON and the Gander Weather Office for the excellent support during the 1982 Ice Patrol season.

Appendix A

International Ice Patrol Ice and SST Reports for 1982

Ship's Name	Country of Registry	Ice Reports	SST Reports
Ada	Panama		8
Aflito	Greece		6
Aida Peixoto	Portugal	1	
Alitokmo	Greece		2
Allegraf	Italy		5
NS Alliance	Liberia		7
Almare Quarta	Italy		2
Althea	Greece		4
CP Ambassador	United Kingdom	2	
SS American Ace	United States	1	
Asian Progress	People's Republic of China		3
Atsatu Maru	Japan		10
Baranja	Yugoslavia	1	
Bardomar	Republic of Singapore		5
Boxy	Sweden		6
Brunla	Denmark		8
Canadian Explorer	United Kingdom	1	
Carainnapeony	Panama	1	7
Caribbean Coverage	Liberia		14
Cast Beaver	Greece		10
Cast Caribou	Barbados	4	1
Cast Cormorant	Liberia		1
Cast Dolphin	Canada	1	17
Centaurus	France	2	
Centra Norma	France	1	1
Centravela	France	1	
Challenger	Liberia	2	8
Corner Brook	Liberia	10	14
Delo	Czechoslovak Socialist Republic		3
Enko Maru	Japan		8
Ever Oasis	Panama		6
Fair Lisa	Panama		6
Federal Schelde	Belgium	1	
Federal Thames	Belgium	2	
Finnrose	Sweden	1	
Flamingo	Greece	1	1
Freedom 1	Republic of Singapore	1	
Garden Green	Liberia		3
Gem	Liberia		28
Ghikas	Greece		1
Godafoss	Iceland	2	
Gule Kestral	United Kingdom		11
Hans Sach	Germany	1	
Hasselt	Czechoslovak Socialist Republic	1	1
USNS Ipigon	United States	1	
Janeann	Japan		11
Janje	Panama		12
Jo Master	Norway		3
Kakogawa Maru	Japan		2
Kara	Finland		10
Karina	Panama		5
Kasturba	India		6
Kelo	Finland		5
Kendrick	Japan		1
Lacosta	United Kingdom	2	
La Pampa	United Kingdom	1	
Lena	Greece		1
Locarno	Liberia		1
London Team	United Kingdom	1	10
London Viscount	United Kingdom	1	
Lotus	Norway		9
Masovia	Liberia	1	2
Mina	Greece		1
Mineral Marchienne	Belgium	1	1

Ship's Name	Country of Registry	Ice Reports	SST Reports
Montcalm	France		2
Montezalama	Spain		9
Montpelion	Greece		2
Namarat	Bahamas		3
Navios Collier	Germany		2
Navios Mariner	Liberia		2
Nobilis	Panama		6
Nordheim	Republic of Singapore	1	7
Norman Mcleod Rogers	Canada	6	
USNS Northern Light	United States	1	1
USCGC NORTHWIND	United States	9	
Osbrook	Norway	1	
Pacific Courage	Canada	1	
Pampero	Finland		5
HMCS Protecteur	Canada	4	7
Quotekara	Finland		4
Radnes	Norway		2
Rio Verde	Brazil	2	2
Ryoko Maru	Japan		7
Saguenay	Canada	5	
Sapphire	Liberia		1
Schnoorturm	Canada	2	
USNS Sellers	United States	1	
Shirane Maru	Japan	2	
SS Sir Gordon	Panama	1	
Star of Texas	United States	2	
Stavern	Norway		10
Stefan Batory	Poland	3	
Stefan Btarzynski	Poland	1	
Stolt Sincerity	United Kingdom		1
Stolt Sydness	Liberia		2
Tachibana Maru	Japan		11
Temara	Trinidad		13
Thala Dan	Denmark	1	
Thasosisland	Greece		1
Thekos	Greece	1	1
Tobruk	Poland		5
Tom Jacob	Germany	2	
Tramcogolory	United Kingdom		2
Tripharos	Liberia		1
Troll Maple	United Kingdom		1
Vela	Italy		15
West River	Liberia		2
World Kinship	Greece		7
World Nobility	Egypt		12
Zao Maru	Japan		1

Appendix B

Oceanographic Conditions on the Grand Banks During the 1982 International Ice Patrol Season

By LCDR A. D. SUMMY, USCG

Background

The 1982 Ice Patrol Season marked the first time that current information acquired from TIROS Oceanographic Drifters (TODs) was used to successfully modify the historic current data base used by the International Ice Patrol's "IBERG" drift prediction model. The IBERG model which has been in use since the 1979 Ice Patrol season (Murray, 1979) has up to this time used a historic current field with no input of real-time current data. Recognizing this drawback, the Oceanographic Unit (until its closure on 1 April 1982) and the Oceanographic Section under the Marine Sciences Branch of Commander, Atlantic Area, pursued the problem of how best to make use of the real-time current information that was being obtained via TODs in the Ice Patrol area.

Procedures

A series of programs was developed to compute total drift vectors from the TOD data. These vectors were then converted into a "quasi-geostrophic" data base which could be used to modify the existing historical geostrophic currents in the International Ice Patrol area. The conversion from a total drift vector to a geostrophic vector was done by taking "analysis" winds obtained from Fleet Numerical Oceanography Center (FNOC), Monterey, computing a local wind-generated current (Mooney, 1978), and subtracting the wind-generated current from the total current vector. This final current was then used to modify the historic data base with a simple weighted average scheme. The modified currents were then relaxed to return to their original values over a two week period unless modified again by a more recent TOD drift. Six TODs were deployed during the 1982 Ice Patrol season (Table B-1). Of the six TODs #2640 and #2598 failed within 24 hours of their deployment. The trajectories of the other four are shown in Figure B-1. All of the TODs were air-deployed from a Coast Guard C-130 aircraft on routine ice reconnaissance flights. The TODs were all equipped with window-shade drogues tethered 10 meters below the surface, drogue tension sensors, sea surface temperature (SST) sensors, and battery voltage monitors. Service ARGOS in Toulouse, France collected all sensor information and positions and relayed them to the Oceanographic Section via computer link. The Section recorded all data directly onto disk via an acoustic modem-computer link. The position information, SST, and current vectors were then generated and made available for modification of the Ice Patrol currents.

1982 Operations

Two TODs (#2638 and #2640) were deployed on 3 March 1982. TOD #2638 was deployed at position 48°58'N, 48°38'W which was to the east of the Labrador Current. At deployment, the sea surface temperature it recorded was 0.9°C. This drifter initially moved in a southeasterly direction until it approached the 2000-meter contour north of Flemish Cap. From there, it turned counter-clockwise accelerating to a speed of 35 cm/sec or greater and moved in a northeasterly direction. Near position 51°20'N, 43°50'W, this drifter was caught up in what would appear to be a warm eddy as sea water temperatures increased from approximately 4°C to 7.8°C and then back to 4.8°C as the drifter exited this circulation. A similar feature appears on the Canadian Forces METOC Center Sea Surface Temperature (SST) chart published for the period 15-18 April 1982.

TOD #2640 was deployed in position 49°00'N, 50°00'W, in the center of the Labrador Current. Unfortunately, it malfunctioned and stopped transmitting after 8 hours of operation. During this period, it moved in a southeasterly direction, as expected, at a speed of 53 cm/sec.

On 1 April 1982, TODs #2637 and #2639 were deployed. Drifter #2637 was deployed in position 49°01'N, 50°30'W which is just to the west of the Labrador Current. The sea surface temperature in this area was -2.1°C. For the first three days of its deployment, #2637 moved towards the northeast until it entered the Labrador Current near 49°20'N, 50°00'W. After entering the Labrador Current, it traveled southeasterly between the 1000m and 2000m contours moving at an average speed of 33 cm/sec. From here, the drifter continued to follow the bathymetry and moved to the northeast and then into a clockwise circulation around Flemish Cap. The TOD stopped transmitting on the 25th of May 1982.

TOD #2639 was deployed in position 49°00'N, 49°50'W. This would normally have placed it within the Labrador Current; however, the drifter's movement indicates the current farther west this year. The drifter began an easterly drift that became a northeasterly drift on approximately 21 April 1982. The original sea surface temperature at deployment was 1.7°C. This progressively increased as the drifter moved east-northeast to a final temperature of 8.2°C as the drifter entered the North Atlantic Current.

TODs #2598 and #2641 were deployed on 4 May 1982. TOD #2598's parachute failed to open and the ensuing impact caused this TOD to cease functioning immediately. TOD #2641 however, was deployed successfully in position 45°58'N, 47°28'W. This time, we again missed the Labrador Current mainstream indicated by the 4°C sea surface temperatures recorded and the subsequent track of the TOD. As one can see in Figure B-1, this buoy encountered cyclonic circulations and entered an eddy between the Labrador and North Atlantic Currents. The final temperature recorded by this TOD was 7.2°C on 3 June 1982.

Review and Outlook

Once again, the value of using satellite-tracked TODs was proved. The evaluation of the TOD tracks showed several areas where the historic current file values were not consistent with the values derived from the TOD data. It is within these areas that the modification of the current files

improved the drift predictions of the International Ice Patrol's IBERG model. The model's predictive ability was evaluated by comparison of re-sighted iceberg data and was found to be within approximately 5.8 (+/− 2.5) nautical miles per day. With the addition of real-time current information from the TOD tracks, we hope to see this error circle decrease.

Evaluation of this year's data and data from previous years (1979-81) suggests that topographic steering (Shuhy, 1981) is a very important process that cannot be ignored in the Ice Patrol area. The data suggests that objects drifting south in the Labrador Current will follow one of three paths as they near Flemish Cap. If the object is between the 200-and 500-meter contours, then it will most likely continue south through the Pass in the mainstream of the current. If the object is between the 1000- and 2000-meter contours it will most likely turn to the northeast and then pass around the Cap. If the object is outside the 2000-meter contour then it will most likely spin off to the east and then to the northeast as it passes north of Flemish Cap. From here, it will enter the eastward North Atlantic Drift removing it *completely from the Ice Patrol area.*

We have found that TODs provide us accurate current information and much timelier measurements at a reduced cost compared to shipborne hydrographic surveys. With the increase in satellite technology, we hope to increase the accuracy of our model by adding more real-time environmental information. During the upcoming 1983 Ice Patrol season we will be testing another addition to our model, an iceberg deterioration program. This program will depend on inputs of SST, significant wave heights and period, and the relative speed of icebergs with respect to the current. LT Iain ANDERSON, USCG, of the Atlantic Area Marine Sciences Branch developed this program. With its addition, we hope to more accurately predict the change in an iceberg's size, which will affect the error of our drift prediction.

References

Mooney, K. A. (1978). "A Method for Manually Calculating the Local Wind Current". U.S. Coast Guard Oceanographic Unit Technical Report 78-2.

Murray, J. J. (1979). "Oceanographic Conditions", Report of the International Ice Patrol Services in the North Atlantic Ocean. Season of 1979. Coast Guard 188-34, Bulletin No. 65.

Shuhy, J. L. (1981). "Oceanographic Conditions on the Grand Banks During the 1981 International Ice Patrol Season", Report of the International Ice Patrol Service in the North Atlantic Ocean, Season of 1981. Coast Guard 188-36, Bulletin No. 66.

Table B-1

BUOY ID NUMBER	DATE DEPLOYED	DEPLOYMENT LATITUDE	DEPLOYMENT LONGITUDE	AVERAGE POSITIONS FOR WEEK	TOTAL POSITIONS
2598	4 MAY 82 ★				0
2637	1 APR 82	49 01'N	50 30'W	43	382
2638	3 MAR 82	48 58'N	48 38'W	81	487
2639	1 APR 82	49 00'N	49 50'W	119	596
2640	3 MAR 82	49 00'N	50 00'W	N/A	6
2641	4 MAY 82	45 58'N	47 28'W	77	307

★ TOD #2598's parachute failed to open upon deployment from the aircraft and the ensuing impact caused this TOD to cease functioning immediately.

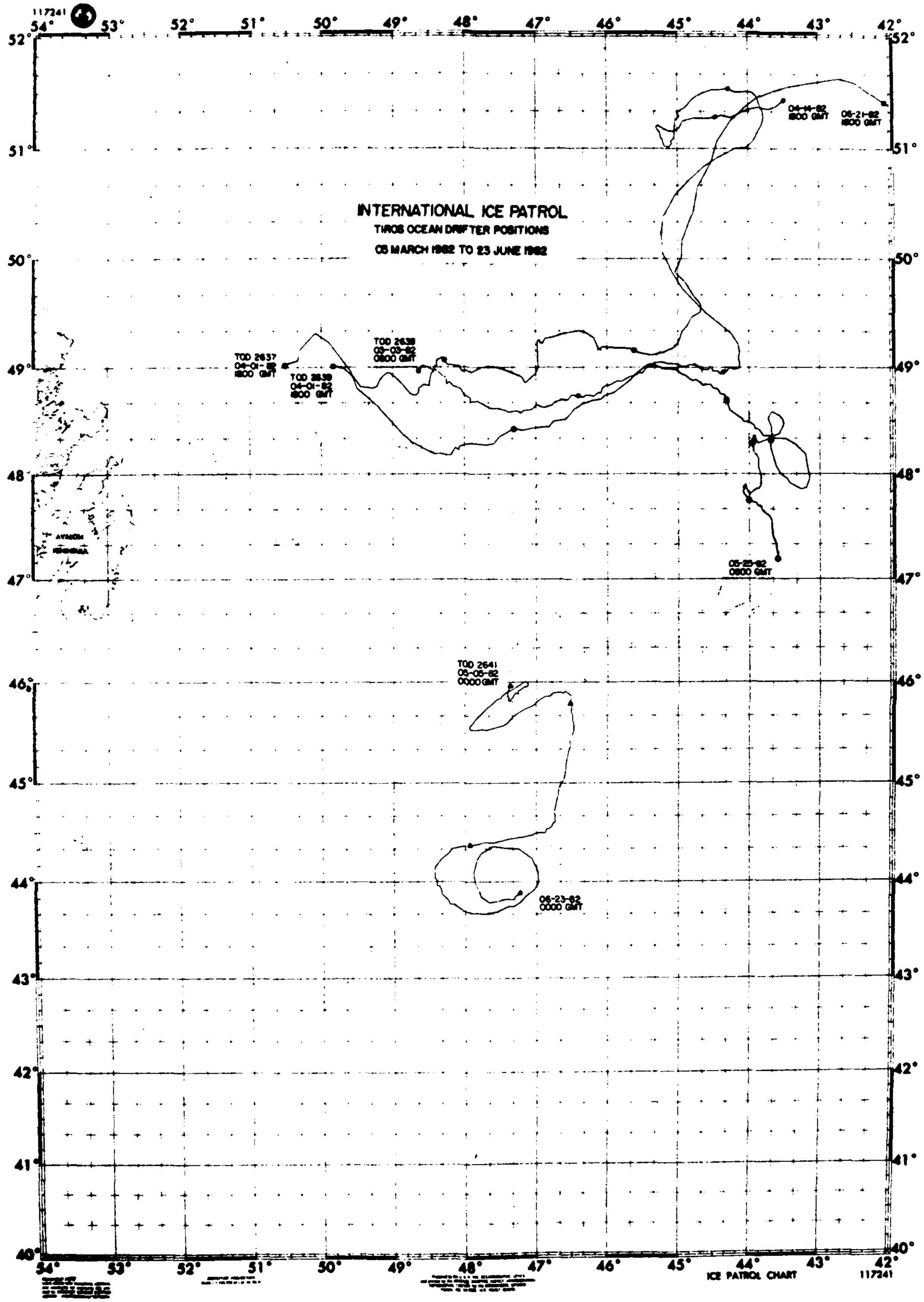


Figure B-1
Trajectories of the TIROS Oceanographic Drifters (TOD)
deployed during the 1982 International Ice Patrol season

END

FILMED

2-85

DTIC